Jürgen Sturm Edit this form

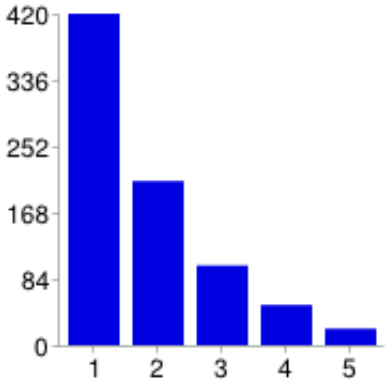
809 responses

View all responses

Summary

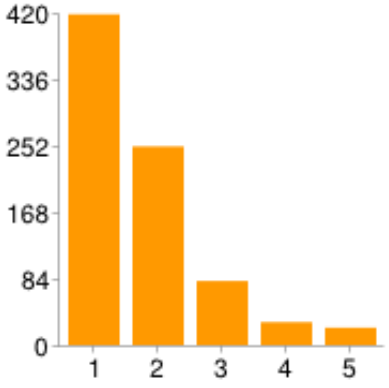
Course Design and Structure

The prerequisites of the course were clearly stated from the start.



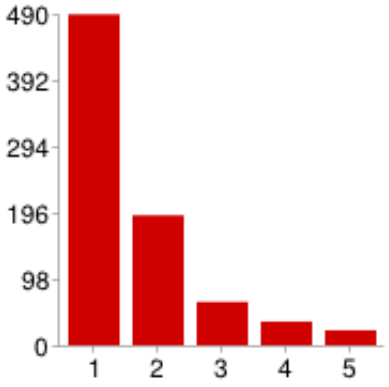
1	**420**	52%
2	**208**	26%
3	**101**	12%
4	**51**	6%
5	**21**	3%

The objectives of the course were clearly stated from the start.



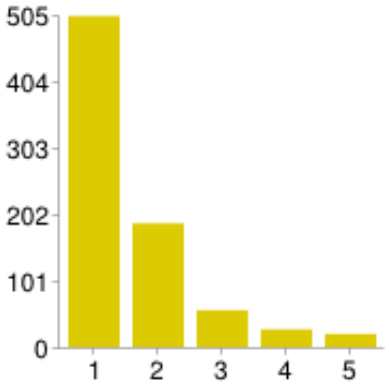
1	**418**	52%
2	**251**	31%
3	**81**	10%
4	**29**	4%
5	**22**	3%

The course website was easy to use and to access.



1	**489**	60%
2	**192**	24%
3	**64**	8%
4	**35**	4%
5	**22**	3%

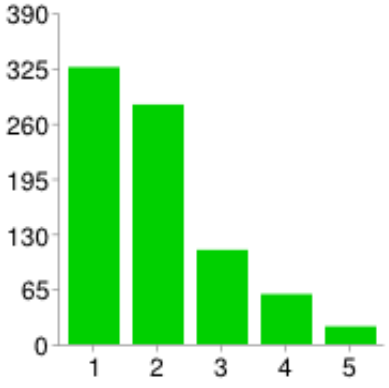
The EdX website in general was easy to use and access.



1	**503**	62%
2	**188**	23%
3	**56**	7%
4	**27**	3%
5	**20**	2%

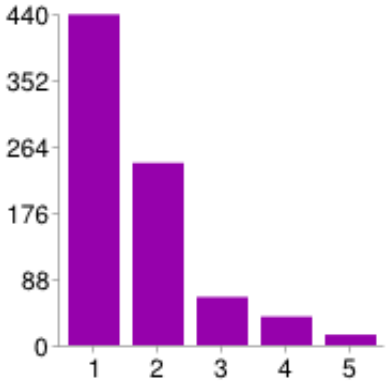
Lecture Content

The lecture videos were clear and understandable.



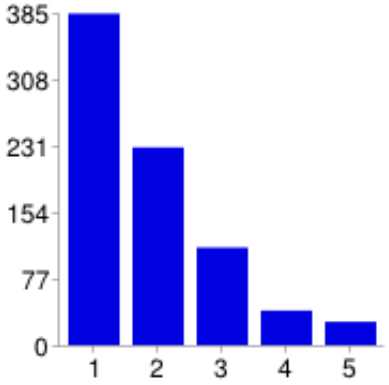
1	**326**	40%
2	**282**	35%
3	**111**	14%
4	**59**	7%
5	**21**	3%

The subject matter of individual sessions was logically sequenced.



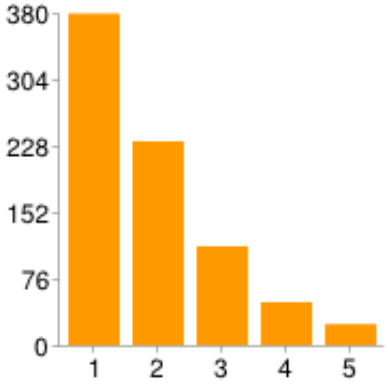
1	**439**	54%
2	**242**	30%
3	**64**	8%
4	**38**	5%
5	**14**	2%

The lecture videos were useful (I learned a lot by watching them).



1	**384**	47%
2	**229**	28%
3	**113**	14%
4	**40**	5%
5	**27**	3%

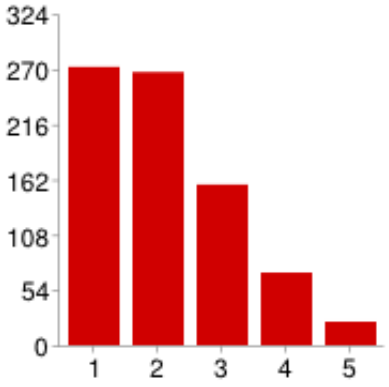
The design of the lecture motivated me to engage with its content.



1	**379**	47%
2	**233**	29%
3	**113**	14%
4	**49**	6%
5	**24**	3%

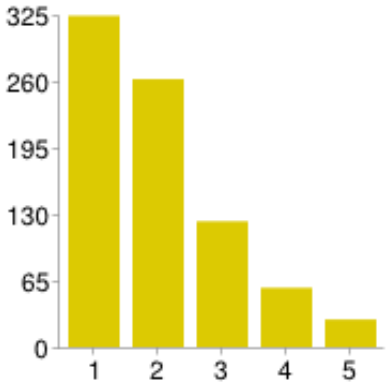
Homework Exercises

The exercises were clear and concise.



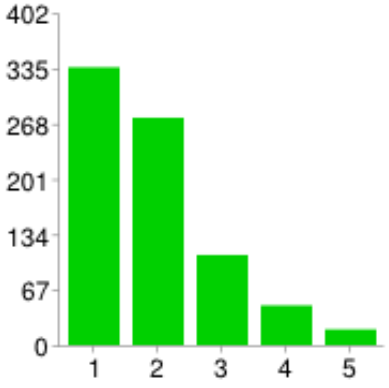
1	**272**	34%
2	**267**	33%
3	**157**	19%
4	**71**	9%
5	**23**	3%

The exercises were useful (I learned a lot by doing them).



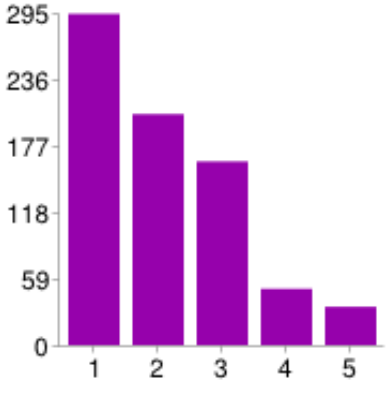
1	**324**	40%
2	**262**	32%
3	**123**	15%
4	**58**	7%
5	**27**	3%

The selection of topics covered in the homework motivated me to engage with its contents.



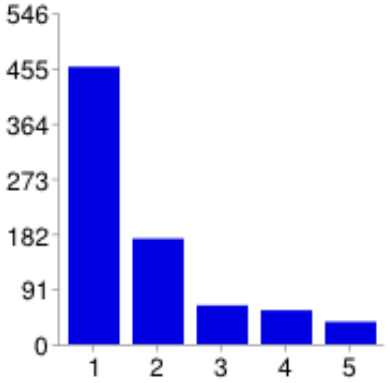
1	**336**	42%
2	**275**	34%
3	**109**	13%
4	**48**	6%
5	**19**	2%

The course staff was responsive and helpful with questions of substance.



1	**294**	36%
2	**205**	25%
3	**163**	20%
4	**50**	6%
5	**34**	4%

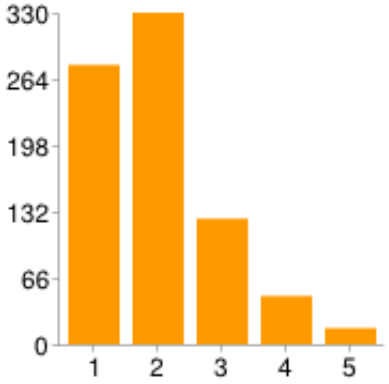
I was able to participate in the course without any major technical problems.



1	**457**	56%
2	**174**	22%
3	**64**	8%
4	**56**	7%
5	**37**	5%

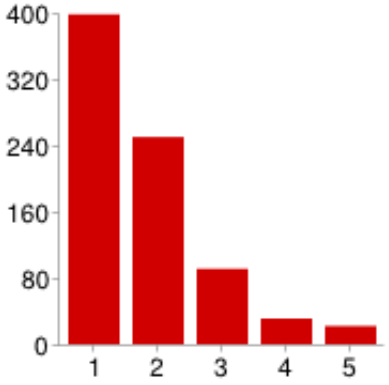
Acquired Competences

I am able to explain important concepts/key issues covered in this course.



1	**278**	34%
2	**330**	41%
3	**125**	15%
4	**48**	6%
5	**16**	2%

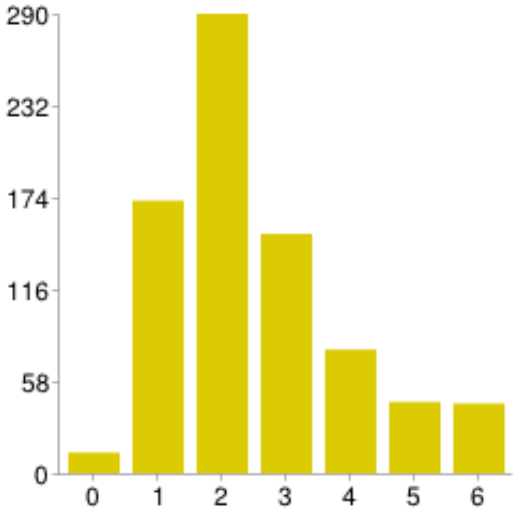
I now have more solid understanding of the subject matter than before the course.



1	**398**	49%
2	**250**	31%
3	**91**	11%
4	**31**	4%
5	**22**	3%

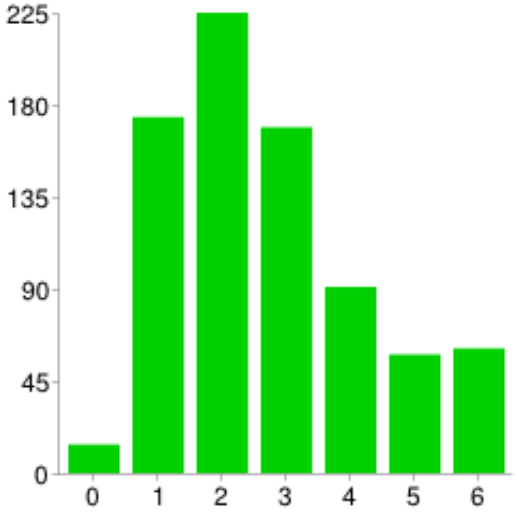
Effort

On average, how many hours per week did you spend on preparation and review of lecture contents?



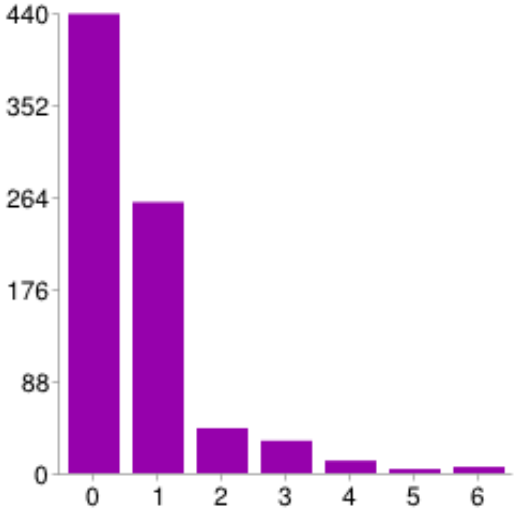
0	**13**	2%
1	**172**	21%
2	**290**	36%
3	**151**	19%
4	**78**	10%
5	**45**	6%
6	**44**	5%

On average, how many hours per week did you spend on the homework exercises?



0	**14**	2%
1	**174**	22%
2	**225**	28%
3	**169**	21%
4	**91**	11%
5	**58**	7%
6	**61**	8%

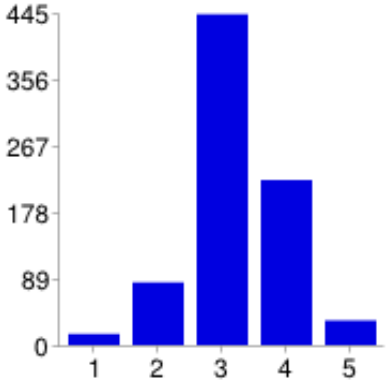
On average, how many hours per week did you spend on communicating with your fellow students?



0	**439**	54%
1	**259**	32%
2	**43**	5%
3	**31**	4%
4	**12**	1%
5	**4**	0%
6	**6**	1%

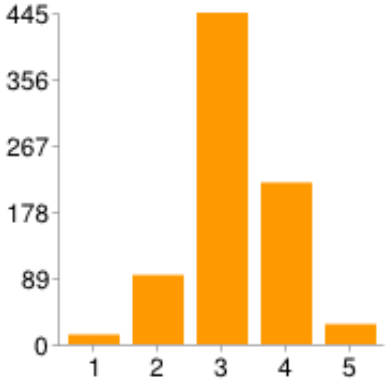
Scope and Level of Difficulty of the Lecture

The level of difficulty of the lecture was …



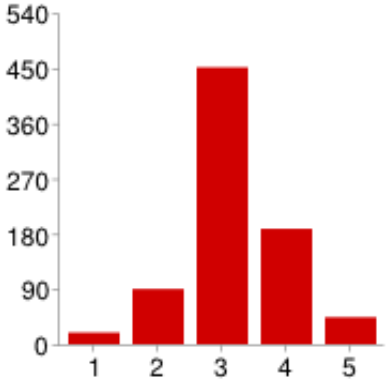
1	**15**	2%
2	**84**	10%
3	**443**	55%
4	**221**	27%
5	**33**	4%

The scope of material covered in the lecture was ...



1	**13**	2%
2	**93**	11%
3	**445**	55%
4	**217**	27%
5	**27**	3%

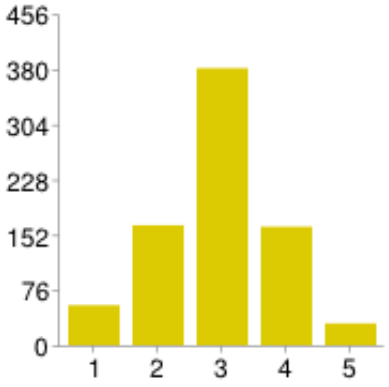
The level of prior knowledge required for the lecture was…



1	**19**	2%
2	**90**	11%
3	**451**	56%
4	**188**	23%
5	**44**	5%

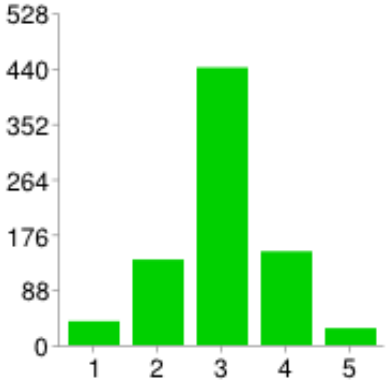
Scope and Level of Difficulty of the Exercises

The level of difficulty of exercises was …



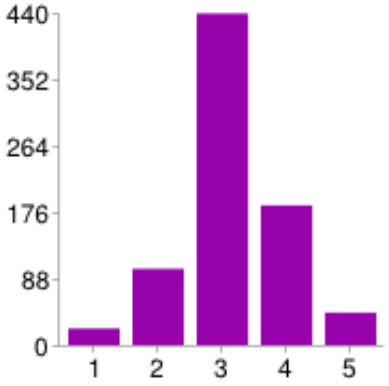
1	**55**	7%
2	**165**	20%
3	**381**	47%
4	**163**	20%
5	**30**	4%

The scope of material covered in the exercises was ...



1	**38**	5%
2	**136**	17%
3	**441**	55%
4	**149**	18%
5	**27**	3%

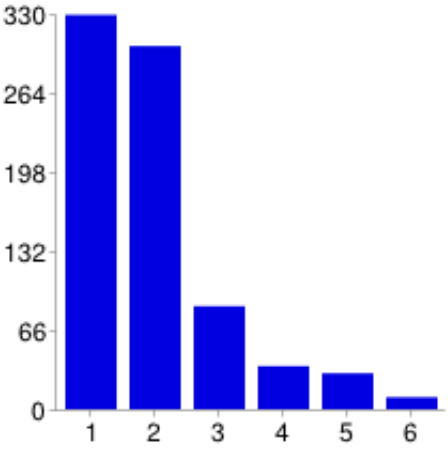
The level of prior knowledge required for the exercises was…



1	**22**	3%
2	**101**	12%
3	**439**	54%
4	**185**	23%
5	**43**	5%

Overall Opinion

What overall grade would you assign to the course?



1	**329**	41%
2	**303**	37%
3	**86**	11%
4	**36**	4%
5	**30**	4%
6	**10**	1%

Comments

What did you like about the course?

I really liked the homework questions which has simulation. It is nice to see the rover move.

It covers a wide spectrum of interesting topics

The visualisation of the python code and the direct feedback was great. Building exercise on top of completed exercise was very helpful to avoid mistakes in the beginning.

Jurgen's smile and blush, hairstyle and especially accent . hehe...

The effort to provide simple explanations to a very hard topics such as EKF and SLAM.

Please make the lectures more elaborate ! they should contain practical examples !

Sir, first of all i would like to thank Mr Jürgen for offering this course . i am a an Electrical Engineering student from India and i really liked this course in fact i enjoyed watching the lectures and doing the home-works.Though this course wanted some prior knowledge in many things like python,PID,Kalman etc but for a student like me who is just in his First year in college the lectures and assignments were doable and interesting.i learnt about many things from this course and best of all i learnt how to implement all the concepts..it really gave my a lot of idea and intuition.. thanking you yours faithfully, AMAN NIDHI BITS Pilani Hyderabad Campus INDIA

I liked simulations with a quadrotor.

Everything about this course makes me think this is the best course on Edx.org. I really liked the supplemental material and discussions on real world applications.

sim was cool

In order to really understand the theory and carry out the homeworks, we need more exercises, examples and so on.

Knowledge about robotics.

The length of the video segments is just right. The explanations in the lectures were clear

Fun and interesting! Hope to have more for such courses!

I really appreciated the arguments offered by the course is the first course of automation on the quadcopter that I've found on the net.

Clear explanation of concept

Topics

I think it was a great course, many information summarized in a way we can learn more and more in the near future, its a kick off course for me!

It did not take a huge amount of time to explain the concepts behind autonomous quadrotor navigation.

The video lectures and amount of content included in each was excellent. Thank you so much for this fantastic course!

The overall coverage of topics related to the area and the results shown by the group in charge of the course

1. Quadrotor simulator and programming 2. Outlook about vision based odometry 3. Searchable slides as pdf for download

The quadrotor simulator was an ingenious addition to the homework exercises. Based on previous experiences with online classes (including classes specifically in the fields of robotics and control theory), I was happily surprised by the addition of a simulation tool. This made the material much more real. Watching the quadrotor correctly fly a mission in the simulator was deeply gratifying and made the course material that much more real. Moreover, discussing state-of-the-art research in the lectures was both inspiring and motivating.

Well structured and scheduled. Gives a good basis for get more insight personally. People and staff were very supportive.

I liked being able to see the simulator running my changes to the code (when I was on a platform that the simulator worked with). I definitely liked the promise to be able to run code on the AR Drone (we have two at my local hackerspace, the Columbus Idea Foundry) - but I haven't seen how that's possible. An announcement about that would be nice.

I liked the simulator

Everything about this course is fine. That's an amazing course and I hope that you do more that these courses in the very near future. I will wait for more courses

I thought some of the lectures were very interesting, especially the lecture on the PID controller

The course provides clear lectures (along with videos). The lectures are easy to understand and very practical. The simulation is wonderful and really useful. Thank you very much!

It connected a lot of threads that I'd previously been exposed to, and wanted to understand, but didn't feel were accessible. They are now accessible. It also opened my eyes to a lot of fields that I didn't realize were out there, or at least were not relevant. Many thanks. I look forward to learning more, finding employment in the field, or starting my own business in this area. This class has given me confidence

to try. If you choose to offer any other classes, I look forward to taking them. Regards, Juaquin Lee Walling MIT, Course VI, 1979 Juneau, Alaska wallingjl01@gmail.com

Really liked the Python simulation tool linked with the theory given in class. Amazing course and teachers! Excellent way to teach us very clear and easy the subject. Really want to thank you for all your time and effort to allow us to take this class.

I liked the homework! It was the best, try to find the answer, for me, I have little experience programming movements with robots, so do it with quadrotors was the best! Thanks.

Very good professors!!!

The course covered enough topics to give a full view of the topic and even got in really deep in some of them. the first weeks where just too easy and the last 2 or 3 where really hard. A very good course.

yes

the course are very clear and the exercices well introduced and target

Platform for Diskussion and the Kindess of all participiants

Practicality and concise presentation..

Clear Information for quadrotor!!

Concise presentation of material. You provided pointers for the mathematically inclined and stayed focused on applications. It was a good balance for what can be some pretty involved mathematics.

I learnt some new things and reinforced things I already knew. The lectures were engaging and well designed. The whole experience was very well put together, by a team that really cared about what they were doing and knew the subject matter very well. Thanks very much for all your efforts! I hope that you are deluged in research students, as you deserve.

its start with the basics,most logical way according to me.

it gives complete layout of the simulation part which is good.

Everything

Nice course

A very interesting subject for a course I thoroughly enjoyed myself - even though I didn't complete all of the exercises

The lectures were planned in a logical order.

I like that the course used autonomous flying robot navigation to teach key concepts in control theory, computer science, and automation in general.

Having taken courses like this one at College, I found it interesting to try a new perspective. And initially, I liked it. I was putting to practice what I have learned before. The problem only appeared when the subjects I was not familiar to the subjects we were talking about. The teachers would not explain anything and they just showed us the names/formulas without explaining how to derive them / what they mean. After some time I decided to quit and stop loosing my time in a useless

class. By far the worst online class I took.

I didn't like the programming assignments very much. The environment was what did it for me. I thought some of the directions were hard to follow. Many times I thought I was following the directions only to find out I misinterpreted them. In addition, to really grasp the programming assignments, I would have had to rewatch the lectures, which is something I did not have time to do.

Good overview of the topic. Now need to dig deeper. But very good start!

I loved the enthusiasm and expertise of the teacher. His engagement and interest was contagious. I really liked the material that was covered, the range of topics, and the level of coverage. I wish the material could be covered in more detail but for the length of the course he did a great job of fitting it all in and all together. I feel like I have a good understanding of the basics of this topic. Thanks a bunch.

I liked how practical the course was. We were taught exactly what we needed to know/get started with everything "quadcopter". It was crisp with no unnecessary information and good exercises.

I am happy that I understood PID (the lecture videos were the best for this topic). I was intimidated by the sight of lengthy formulas...etc..

It was comprehensive and I liked the lectures as well as the exercises. This is one of the best courses I have taken on edX.

Fantastic simulations

very good lectures

I thought Dr. Jurgen Sturm was an excellent speaker and I really enjoyed watching the videos. I found them thought provoking and would be interested in participating in another course taught by him should it fit into my schedule.

The content, the idea of making a automated robot

Online quad rotor simulation was extremely useful, I think that it's the main feature of this course. Playing with python code online helped very much with understanding key concepts of pure mathematical statements.

Practical coverage of all the math theory that I'd forgotten since school. Great content that removes the mystery about how UAV's work from concept through to hardware and software.

The course was a very good integration of tow of my favorite fields - robotics and computer graphics. Very well made. :)

Subject matter was phenomenal.

I liked the innovation theme, the didactic form of classes, good videos and educational material in general a good course. Congratulations!

Unfortunately I did not have enough time to follow and complete the course . Anyway I found it very good. Surely re-watch the videos and read the content for better understanding.

The subject is very interesting and the exercises were very practical, making it possible to learn while doing it.

research activities at the computer vision group of tum

Exercises, I think it should be two more weeks to enrich the objectives

The best thing about the course was the content. I never got an opportunity to do such a course with hands on coding and simulation (though they were easy). Now I have a base on which I can build my own stuff and explore the world of automation and controls. I hope we can get a second installment of this course in the coming months.

Diversity of topics, examples, the use of the simulator, good explanation, the flexible due dates.

It is fun introduction to the Kalman filter, brought to life by an interactive simulation and practical examples for quadrotor control. It packs a lot of interesting information into a short course.

its online and it costs nothing .....excellent portal

The homeworks

Jurgens' lectures were informal, vivid and helpful, I did appreciate them! Maybe the last lectures should be presented in the first part, as to motivate the students about what's being researched by this Group and how the concepts to be covered in the course would then be applied in practical situations.

Definitely the simulator and programming in python

Thank you to Prof. Cremers, Sturm and Kerl. The course was wonderfully laid out and I learned very much from the last few weeks.

I liked the way lecturers connected topics from modelling, control, perception, and probabilistic filtering and applied it to the quadcopter navigation.

I loved the simulator and the exercises provided.

It contain computer version and control system, The both I like.

* Kalman filter and probabilistic path estimation. * Position control by using video camera data.

Thank you very much! I like this course and quadrotors :)

The interactive video were really interesting and motivating

I have learned a lot.

The course was really good.Enjoyed a lot..!!

It was very useful and was worth the time spent on the course materials.

i love the first video because you could understand and see that the person who was talking about quadrutors -i dont remember his name right now- knew about it and also like them, but in thesecond video it was really boring cause this person was just sitting there, tellig andexplaining you stuff but it was difficult to really focus on it -because there wasnt any emotion on his voice-

a little simple,not cover enough knowledge

The simulator was a brilliant idea and you did a fantastic job implementing it! Please share more computer vision and robotics courses, this was tons of fun. :)

The topic, the simulator in the exercises and of course the likeable lecturers.

I new the mathematics part. But this course shows me a wonderful real application.

Love it. I am really grateful to the Prof. Jurgen Strum & the staff and edx for this wonderful opportunity. Thank you!

The willing to share the latest research on this field! Thanks a lot.... :)

The practical and intuitive approach to the subjects covered in the course, and the great enthusiasm of the professors.

I thought that the pace and the structure of the course were excellent. Other EDX courses I have done have required much more time and have been a more difficult commitment. I thought that the video sequences of your quadcopters and data capture examples were very informative and entertaining. I hope to see you offering more courses in the future.

The content was to the most satisfying for me, It's just what I expected. It was much educational for me. The subtitles helped me much , because I speaking spanish and the english I understand reading Thank you very much staff for the course.

1) We had very nice and clear linear algebra and probability theory review lectures. Those information really helped in other MOOCs too. 2) Lectures were informative even for a person new to the subjects. Learned a lot mainly about Kalman filter, motion estimation. Thank you for all the effort and help :)

Very logical organization of the course material.

The subject matter is very interesting, The level of math is just right (The course presents the concepts needed, without being too much heavy). The style is engaging. I would say the most important thing is that the instructor obviously loves what he is doing. There is really no substitute for that. I expected this course to be different: I thought the lessons would be a chore, but I would be rewarded with the knowledge acquired. Instead, the lessons were very pleasant. ANA I was rewarded with the knowledge. BTW, I didn't fill out the questions asking how many hours per week I devoted to different aspects of the course, because I have no idea - I wasn't counting. However, this is one of 6 simultaneous MOOCs I was following, and I also have a day job and a family.

The graphical interface of the exercises. The material itself. While the python coding was unfamiliar to me, I was able to complete most of the exercises.

great course! i gained new knowledge. thank you very much!

This is an excellent course. It covers a wide range of topics.

Great topics and very good course material

Lectures were informative. Recent researches from the vision group were presented.

everrythink is good

- Videos with written transcript (nice). - Feedback in week 2. - Good feelling of Jurgen in lectures.

If I had completed the course 9 years ago when I was writing my master's thesis with 100% as I achieved now it would take me 50% less time to finish. Great job with this course!

This was an excellent course taught by outstanding professors.

generally excellent

I forgot in a previous response - having all of the assignments due at the end was brilliant. MOOCs are great for teaching university level or near university level subject material, but it doesn't mean it has to be taught like it is a university. Most people doing the course are working as well, so the flexibility this gives is brilliant. I honestly couldn't have done the course without the ability to drop it for a couple of weeks in the middle and catch up at the end.

interesting subject

The exercises were the best yet I've seen on Edx. A perfect bridge from theory to practice with a good deal of interactivity. It armed with real knowledge to use outside of the course.

I really do like the way its been logically arranged. Ex: Going from 2D to 3D.

Thanks a lot for such an effective course ware design. I like the efforts made to make us understand all the basics.

How to transfer the math to code.

Give a very good overview on the subject.

Practicality and concise presentation.

The subject is practical, relevant and important

The all idea of autonomous robots and their use in the close future.

The Homeworks with the simulated quadrotor was very very cool and good to play around with.

subject

- the variety of topics - the forum discussions - most of the programming exercises

I like that we can purchase a quadcopter that matches the course.

Demonstration videos, explanatory visuals, and the demo programs working within the browser were great tools helping a lot. Necessary backgrounds were provided before being used on more advanced materials which was a great way of helping students understand the concepts. I congratulate you on preparing a very good environment for students to follow and understand what is offered. Although very advanced mathematical concepts were used, exercises were easy to complete and this provided motivation to follow the course. I also appreciate that the course was provided in english; a previous course on Coursera from Martin Kleinsteuber of TUM was offered in german and many people could not follow it.

I really enjoyed the course, because it simplified somehow the materials related to quadcopters, i've been doing some researches lately and the course you offered was like the glue that gathered all the informations and made it possible to understand its use and applications. Also, providing a simulator was of great importance, made it possible to have a realistic feeling of what we learn contrary to other courses where it is pure theory.

This is a very complex subject that requires advanced mathematics. I had the prerequisites but from a long time ago. The course started with an overview of the math we would need then built smoothly, although exponentially, up in complexity on the course topic in each lesson. I was looking forward to the release of the next

lesson each week. I am working on the electronics for a quadcopter at my job. I believe I am now as knowledgeable on the navigation principles and algorithms as anyone on the project. The class was very timely and a boost to me on my job.

One of best courses on edX for real learning experience. The runtime navigation/coding platform was a joy to use and really encouraged me to keep working.

None

The virtual quadcopter was very cool. It's really great to see the implementation of the exercise in action.

The simulation-based exercises were great. I enjoyed all the contents in this course. Congratulations!

Concept very well organised and presented. Wish I had more time to work on the exercise,

The simulator and the Robot (parrot + ROS)

Stimulating, challenging and enjoyable. Delivered on my expectations.

Only one deadline in the end. The clarity of thought of the professor.

I liked the kalman filter section of this course. It was the most challenging and encouraged me to do more research to complete the homework. I really enjoyed the last lectures where visual odometry is discussed. I would like to attempt this kind of thing myself.

For me this course was a good introduction to the concepts and solutions to the problems about control in general and quadrotors in particular . I was very stimulated to start every week and solve the homework proposed . Just want to thank to everyone in the team who made this course possible, i enjoyed it a lot . Vicente Cubas

The best thing was the simulator and the practical exercises.

I enjoyed the videos, very useful and well explained

It's a sound and fast introduction to the Drones world and tools. It provides an accessible entry point at a professional level.

The topics covered.

Didn't use a lot of time, because i moved to a new location with my kids and wife. Otherwise i would have spent more time. The last excercise (the race) very fun stuff :)

Es ist löblich, dass die TU München einen MOOC mit einem interessanten Thema (Dronen) anbietet; Aber es gibt noch sehr viel zu lernen: mittlerweile habe ich mehr als 10 MOOCs erfolgreich abgeschlossen und dieser war im Wettbewerb mit anderen Top-Instituten nicht gut. Im Gegensatz zu traditionellen Unis sind die Switching Costs eine andere Uni zu besuchen beim Online Learning gering und mit jedem neuen Kurs werde ich radikaler, eine Uni einfach abzuschießen, wenn das Material nicht gut ist. Hauptkritikpunkte hier: 1) Mangelndes Feedback, zu wenig Präsenz der Professoren(!) und Teaching Assistants; 2) Keine Erklärungen zu den Exercises. Falls Sie ein klassisches Pyramiden-System bevorzugen, eventuell eher Struktur als

SPOC statt als MOOC mit vorheriher Application. 3) Professoren vermitteln Eindruck, dass sie nicht 100% hinterm dem Projekt stehen. Herr Sturm war gut.

Quad-rotor simulator used in homework and exercises.

thank you from Goianésia-Goiás-Brazil! thank you all! contato@corei.com.br

I found this course very interesting and enjoyable. I am only in 10th grade and so the topics covered were rather difficult but i thoroughly enjoyed the course and it inspired me to go ahead of my level. Thank you to all the course staff.

Good lectures and examples. Thank you for the interesting course!

Everthing!

Inspirational and motivating enabled me to select my career.

I liked all the effort you made. I congratulate you about that. I also liked that the lessons were very clear!

I loved the simulator once I was able to find a browser that worked with the full simulator. The lectures were also engaging and interesting.

I really liked!!! It's a grate area and I'm really interesting about this!! So congrats You make able for me learn by amazing way about this topics!!!!

The lecture provides a very solid technical work on UAV. I learned a lot in this course. :)

It had an emulator and I could learn about programming the quadcopter.

simulator and it's programming in python

In generally, the course exceeded my expectations, both in terms of the enjoyment it gave me and the increase in knowledge it provided. I last studied vectors and matrices in the '80's, so the overviews were very handy. On the other hand I struggled to get into the computer programming aspects, and had to spend much time online learning more about this language. It was a lot of extra work for me, but challenging and interesting. I am extremely happy I did this course. My mind has lit up like a christmas tree ... it has been such an exciting experience.

The exercise were really resourcefull and provided me an approach to solve problems

The course was designed to engage the readers into the world of Quadropters. As fascinating as it sounds, the course completely stood upto the level of expectation. There are always some chance of improvement which is true for this course also. But the lectxure content and the interactive simulator immediately gave an urge to try and have a deeper understanding about the course.

Nice organization of the Homework and study lectures together..

I have touched most of the topics presented in this course sparsely and independently, either at the university or during my first years at work, not always related to navigation and/or image processing. Thanks to this course, I was able to refresh them all together, focused on an application of my personal interest (drones/quad-rotors).

Lecture, examples, simulation in the exercises.

My first robotics course. Very useful and helpful! I now link concept such as Kalman filter to the real world problems, especially through the last assignment that combines everything learned. In particular, the markers are the key point to link the true world and the state in the Kalman filter.

it's ok but homeworks must have plus level

New course so a lot interesting but homework was too tough.

I absolutely loved this course! Professor Jurgen was amazing on every lecture making clear as possible all the concepts and their applications. I enjoyed all the technical and practical aspects covered in this course and appreciate so much all the effort that was put by all the staff on the lectures and homework exercises, specially the simulator ones were amazing!

1) It was a good starter on the main ideas. I am very satisfied with the course because I feel I am able to learn much more and faster than before. 2) I think the expertise of the instructors, mainly Dr. Jürgen, was well conveyed.

I like the short precise video presentations, i like the Python programming excersise and above all i love the quadcopter simulator Thank you all staff for a fantastic journey into autonom vehicles

The subject matter is excellent and the coverage was good.

Nice!

The course was useful, I hope to finish it later this summer at home.

This course is very well designed and is meant for undergraduate engineering or masters students in general. I thoroughly enjoyed the course; it provide me insight into robotics, image processing and measurements with the practical applications. As a next step, I would like to put the theory learnt in this class into practice in one of my research projects. Thank you Jurgen.

-- I thought that Dr. Sturm's lectures were very clear and concise, especially considering the breadth of topics that were covered. It was also clear that he is enthusiastic about the subject. I think that this last point is sometimes easily overlooked when teaching classes. I believe it's human nature to subconciously take cues from a teacher's demeanor. So if they appear to be interested in the lecture topics themselves, then this attitude will help energize the students as well. Dr. Sturm did a good job with this. -- Though I've previously encountered and/or studied some of the material covered (for example: vectors, linear algebra, probability, and even rotation matrices), I had, sadly, forgotten quite a bit of it. Therefore, I'm grateful that this course forced me to re-familiarize myself with several of these subjects, and hope to continue my study of them. -- I was not at all familiar with some of the other topics covered, such as the Kalman filter. I thought your introduction to the subject was very good. -- I thought the course did a very good job of introducing the many different skills and tools necessary to create and operate an autonomous vehicle. (Sensor & motor technology, control theory, image processing, odometry, etc.) The only "negative" from this coverage is that it made me realize that I still have a lot to learn (& re-learn) in order to become proficient in this field. Of course, even if this realization is uncomfortable, it is not actually a negative. ;-) -- Thank you

for your time and effort in creating and teaching this course!!

- i love the simulator, could it be open sourced? Danke für den Kurs er hat mir wirklich viel Spaß gemacht :)

In the field of quadcopters it can be tricky to find proper learning sources. This was definitely a booster.

the quadrocopter simulator

the exercises were great. good use of simulations and python as the base language. i loved how it was all linked to the parrot AR Drone.. making it very practical and relevant.

It's wonderfully,especially for the WebGL simulation program!

The course itself Autonomous navigation for Flying robots.

I like the relative down to earth attitude of the teachers. While I would have liked just a tad more background and insights, it is very refreshing to see a course that is not totally drowned in math. However, I was able to do most of the exercises with just a cursory look at the material: I was held up in following the course on a weekly basis and had to cram all lessons and exercises in the last three days; this somehow tells me that it was a bit too easy :-)

I liked the fact that it was trying to address a difficult subject in a rather simple manner. And I would really love to see a follow-up course that is more practical oriented.

It is really cool! Thanks a lot for this.

I liked the simplicity about the course. Teachers were able to very clearly motivate, explain the concepts. Thank you to complete course team.

Although due to my day job and other constraint could not completely finish the course and exercise, but it did gave me a lot of direction regarding what problems to solve for quadrotor and where to look for related content. It was indeed inspiring and help me to take on quadrotor.

I just want to make the quadrotors fly at first. Since I entered a startup company, quadrotors have become friends in my job.

Concise lectures with topics that covered a wide range of material. The python simulation for homework was really cool and a great interactive tool. Presenters were knowledgeable and easy to understand. Cool subject matter.

Excellent combination of the theory and practical exercises.

Invested teacher

the thematic

I like the course contents.

1. Web-Based Simulator 2. Python-Code, that can be run in real Quadrorotor 3. Get change to know Cutting-Edge-Research achievment

The course was a good exposure to the world of autonomous robots, the logic behind most of the theories and technologies being used on field by the top researchers and programmers. Additionally how vectors can be used hand in hand with programming.

for me most interesting topics was kalman filter and visual adometry beacause the content was totaly new for me and I found the content easy to flollow and at the same tame it give a clear idea about how they works I also liked how the simulator works and it was fun using it in the practices

I really enjoyed the idea of the course and the material covered. I found it all extremely interesting. The quadrotor simulation exercises were very well thought out and I found it very helpful to see exactly how a quadrotor would behave when given certain commands.

Like about the simplified point of view of very complex subjects

The subject really kept me interested and pushing myself forward to learn more. Reading through the comments helped greatly with my understanding of questions being asked of the homework.

It teaches subject like state estimate with real life application and example through quadrotor. And it is very comprehensive.

I greatly appreciated more than anything the "one due date for all coursework." I am extremely interested in this course and wished to complete it and receive the certificate. This was extremely handy because even though I had an agreement with my VP for a "lower capacity work level" for May/June at my job, this was suddenly overturned when several Engineers decided to leave the company. My working 70 - 90 hours a week in May & early June meant I could not feasibly complete the coursework until late June. Again, I appreciate this "one deadline" approach and encourage online education to mimic this philosophy so that busy Engineers & Executives can still participate & achieve a certificate. I enjoyed the main presenter, Jürgen Sturm. He was very descriptive in his lectures and helped to make this a very fun experience. I appreciate having download access to the material. It allowed me to view & review the material offline during my very busy schedule this past month. The code-to-visual simulator was very impressive---the best I've seen in an online course. The amount of errata was very low compared to many other online courses I've taken. Thank you!

I enjoyed the lectures and had a lot of fun with the robot simulator.

Simulation quiz is very effective for learning.

The simulator.

I liked the possibility to make excercises in python and the quadcopter simulator.

It presented a lot if valuable information that I will benefit from in the future.

The lectures were fascinating and the exercises were really interesting

Loved the current reaserch and the brainstorming ideas for possible quadcoptor uses. i was really hoping for more of this content. tieing in current reaserch to that days lesson, perhaps with a worked example of the math to match the video of the quad doing it might really solidify what we are trying to do here.

Do you have any suggestions for improvement?

I tried to watch the video through GoAgent. It works fine on Windows, but I have got

a lot of technical issues on Fedora. It is slower a lot on Fedora than on Windows. Maybe set up a few mirror sites may help.

The homework can be done only on the web page. Providing a program and a data set for doing homework on off-line will improve the accessibility to the homework.

I am looking forward to the second run of the course:-)

Maybe in the future offerings you can better explain the PID controller and the 2D geometry part may come with some preparatory exercises to better understand the ideas. Thank you for the course !

a pdf document is better as notes than slides.

If there is a part about hardware buiding,I would be prefect!

More simple exercises to grip the topic. They do not have to be graded. Just examples.

Doing practical examples in lecture videos

IMHO, too much Python (especially after the middle of the course). More quizzes will be better for understanding.

Have a stand alone simulator one can run on your own computer, which would make debugging a lot easier. Also it would increase the willingness to "play around" with different settings, different algorithms. Have a bit more examples, perhaps videos of the TUM drones performing those same exercises we wrote for the simulator; see how the (real) drones react to different parameter settings, e.g. overshooting due to wrong PID params.

I have basic understanding of python, still I face difficulty while solving the exercise. I think, it would have been better course staff provided some material on numpy and few more examples would have helped certainly.

Simulation is great but feels a bit like plug and play exercise. Lacks the path to mastering all the steps to get to the solution. But I really enjoyed the course.

I hope enhance coverage of scope of knowledge and depth.

Offer Classes that deal with Vision on its own and complement the class

I would prefer a longer course not too condensed, it´s really intense and you have little time to understand all the concepts.

It is related only for commertial ardrone and more for visual odometry. Im trying to make drone for myself using only IMU, MCU and etc. It is hard to use material of those lectures to build stabilization from scratch. No view on drone phisical model. I dont know from where get covariances for calman in my case, But in all cases it is a great course. Even I got ill for last 3 weeks and not complete it. ^(

More details on how to model and control the quadrotor. There must be more lectures on control theory and modelling.

Make the Simulations available for offline use, too.

This course definitively requires, a "solid" background in linear algebra :). I understand that an 8 weeks course cannot start from scratch. Linear algebra and statistic, were quite an "old story" for me and I just know Python basics. I needed to "Google" many times to find some more detailled explanations about things that

sometimes appeared as "given" or obvious concepts during the lectures. Especially about quaternions and Taylor developments. The course definitively misses some examples, web links, or pdf. This "Powerpoints only Mooc" is definitevely frustrating. Powerpoint are ok afterwards or for people who already know the subject. About Python : wasn't so difficult after all. Except that everything is based on "object programming" !. Just think that the "self" prefix is quite annoying when you never needed to used object before ..and that you need to understand that the main part of the simulation is "hidden", just calling functions developped by the student in the HW. All in all : because I like to learn, because I like to be challenged, I think I got a lot from this Mooc (graded 99% so far), but without the power of internet, I'd have probably gave up as soon as the second week ! Thank you anyway for all that. I'm fully aware that's a huge task to develop a Mooc about such a complex subject !

Yes, include some more demanding homework exercises.

More quizzes and tutored practices.

Split the current lectures into shorter ones, no longer than 15 minutes. In the beginning of the course, I would watch a lecture while simultaneously taking notes. This worked when the material was elementary, but as it got more difficult, I found myself pausing the lecture so I could catch up with the material. This turned a relatively short lecture into a long drawn-out process.

The level of python coding required was certainly underestimated, which proved to be the major reason for me not really reaching the end of this course and gaining a certificate. Perhaps I would have benefited from some references to coding, or code examples a lot. It also would have been nice if the simulator didn't crash at the most inconvenient times.

I would have liked for the slides of the lectures to be avaliable

Would have loved to use some programs to control an actual quadcopter right at the beginning of the course.

The Quadrotor-Simulation is great, but sometimes it may be better to have an offline version (best as python lib). Perhaps you make the course 12 weeks long and also focussed on ROS. This will be my next step - installing ROS on OSX and buy an air drone...

State in your prerequisites that you require a very high level of python programming. I know how to code using python and I wasn't able to solve most of the coding problems.

We need more programming exercises related with the algorithms reviwed in the course.

Was expecting to learn more about object avoidance

the lectures could be more clear

df

add more tasks to homework exercises

Kindly use real time writing thing (i don't know what its called)....like the ones used in udacity (i could think only of that course website). When the teacher writes and

explains, we students feel more connected to the course and hence our attention improves due to curiosity. In short, kindly don't use prepared slides for teaching, instead write and teach. However you can give away the prepared slides as reference PDF (like how its done now)

1) Web editing/running of Python is a bit difficult. - add reset program in case you loose original code and screw it up - maybe allow people to run it on their PCs (debugging is easier) - graph plotting in last homework didn't really work (didn't reset after a run so after some time it was a mess)

The homework was a bit too leading. Often the problems could be solved with a line or two of code that was simply a translation from a formula in the slides to python code. This meant that I could solve the problem without really understanding what the code was supposed to do. I also find that lectures that go over 15min are a bit hard to sit through. I also like the way that Coursera courses (in particular Andrew Ng's machine learning course) have questions interspersed with the lecture video.

1. The lectures should be made more understandable. Dr. Jurgen was quite difficult to understand. 2. The matter was covered quite superficially. 3. Assignments were loosely related to lectures. Note- I had taken Machine Learning by Andrew Ng on Coursera, and found the lectures there quite more clear, the assignment instructions were easier to follow, and the agreement between lectures and assignments was better.

Perhaps more discussion on how visual odometry (without knowing the pose of the markers, ie edge detection and slam methods) could be used in flight planning / obstacle avoidance? Everything about the course was fantastic, hopefully you will do another level course on these topics!

My only comment would be to include a bit more of low level design for the quadcopters in general, for everything else was amazing!

Make an extension to this course for C++ and exercises a little bit harder.

Exercices were all right, but maybe more quantity is needed and a litlle bit more challenging.

I found some of the topics a bit difficult to master. I think that it could be useful to have optional workshops showing worked examples, perhaps even from the simplest possible example and then working up in levels of difficulty. This would I think be excellent for assisting consolidation of the knowledge gained while not increasing the time taken to complete the course for those who are already familiar with the concepts. For me, personally, I found weeks 1 to 5 fairly easy, but I started to struggle when it came onto the Kalman filter stuff. I now understand the basics of Kalman filters but not to any level of depth.

It would be nice to learn how to build a quadcopter from the scratch maybe through an extra workshop.

Maybe for the vision related topics, you could focus on teaching the basics really well and just give a broad overview of advanced topics and current research to pique the student's interest. Or making a sequel course for that would be really awesome!

Maybe a follow-up course?

More step by step instruction for the end matter. Too much time was taken searching through the pdfs looking for the correct set of equations. The internet help was better. For the last exercise a huge process noise was copied in and I don't believe there should be hardly any process noise. The velocity should of been considered measurements and the error associated with the velocity should replace the process noise.

This course would have been awesome if the instructors had used programming examples in the videos. Lot of us faced real problems with python programming.

More example. More material. More courses on robotics.

Saving programs didn't work all that well for me. I ended up periodically copying to and occasionally restoring from an external editor. Save doesn't work at all unless the program "compiles" without error. The introductory lecture in a brief mention of how a fixed wing aircraft stays aloft credited the old canard of Bernoulli's principle and an airfoil shape. A more pertinent explanation for this course would be describing how the wing deflects air downward, i.e. exactly the same physics as is used by a quadrotor's propeller..

Don't have hours of difficult maths on the video unless it helps do the assignments. Have a reference section.

Include programming lesson.

The Lecture were sequenced properly however the examples related to Kalman filters and other mathematical problems were very few. Also the level of problems should be raised as many people wants to go beyond what is offered, so there should be a optional practical exercise (programming) to offer deeper interaction.

I would suggest adding a few more questions after a lecture series instead of sometimes just having the programming assignment. This would ensure that all the aspects of the lectures are tested (and in so doing reviewed by the student).

I think the lecture can be more detailed, pls reference the coursera's course "automous robot" form Georgia University.

Much less focus should have been given to the basics introduced in this course: linear algebra, statistics, estimation, computer vision basic materials etc. I truly believe that people that do not have these basics should not take this course ! Thus, only a 1 lecture introduction should be sufficient to cover all of these topics. Regarding the exercises, some of them were really unclear (e.g., exercise 2 , 3 python code, exercise 4 in the questions, exercise 6 the python etc.) . Also , regarding all the questions of the python script, many of them were compiling a code which was not visible to us (behind the scene) and it is something that makes the understanding of how the quad rotor behaves much problematic.

More courses in detail, e.g. Computer Vision is a huge course itself.

The course probably can extend to describe interfacing with the real world through various sensors.

Although I do not own an ArDrone myself, it would have been cool to see the homework excercises executed on the ArDrone in the videos.

There is only one thing I was disappointed in, but I don't think it could be fixed without extending the course from eight weeks to 10 or 12 weeks. There were some topics, especially those related to computer vision, that were too superficial to actually put to use. Having taken this course, I would not be able to program a drone's camera to recognize visual targets. I could use the derived position in an odometry algorithm, but I couldn't go from the raw image of the camera to a sensor measurement to be used in the algorithm. As a result, I couldn't actually make a drone fly, without going further into the reference material. As I noted, eight weeks probably isn't adequate to actually achieve that goal, but without it, students are left without the ability to actually realize the algorithms on real world targets. Perhaps linking this course to another one specifically on vision algorithms?

Although I was able to use the formulas to control the quadcopter, I often didn't really understand the mathematical workings and couldn't not connect the numbers to the simulation or model. Such as the PID control theory and Kalman Gain. Admittedly I did not pay too much attention during the videos on the probabilistic state estimations. Maybe some psudocode to assist with the programming and more easy to follow, step by step theory. I felt like the coding should be secondary to the theory of quadcopter control, at least that was what my priorities felt like.

Content: The content was great and if the intention is to keep it for grad students, I don't think changes are needed. If you want to make it more accessible, it would be helpful to link to material to get people up to speed. For example I realized pretty quickly I needed to get up to speed on linear algebra and fortunately someone in the discussion board pointed me to another EDX course, UTAustinX - 5.01x Linear Algebra Foundations to Frontiers. I feel a few helpful links would make the content more accessible and better share the great work your team is doing. Technical: An issue i had when working with the simulators was if i clicked outside of the code box (to see the simulation) and then hit backspace thinking i was in the code box, it was browse back and lose all my work. If its at all possible to have it cache the code so if you browse back and the forward it remains there, it would be helpful. If not possible perhaps a note above the code window to copy your code to clipboard for safe keeping.

...well, perhaps there I one minor thing I can think of to improve: the stop button on the quadcopter simulator. It seemed to work only intermittently and slowed my ability to "experiment" with my code solutions. The only other thing I can think of is the information about programming and performing the same "experiments" with an actual AR Drone. I am researching that now and there are many issues I have to address to get up and running to accomplish this. Other than that this course was of the best of the 20 or so MOOCs I've participated in. Thanks again!

The homework exercises can be improved, but the course was very well structured.

I honestly felt like the homework assignments were not commensurate with the level of difficulty of the lectures. I was consistently "let down" with how easy the homework was, and it rarely increased, or even solidified, my knowledge of the material. I do not feel that the lecture adequately prepared me to program a quadrotor

to do even basic tasks. The passing criteria was very low; don't be afraid to scale up the difficulty a notch! The requirements for this course mean that your student audience is likely more capable than you think or that the course was designed for. Lastly, I had several problems with the WebGL applet using Chrome. It would often fail or go into fallback mode. Great experience, but I feel that it could have been so much better if the homework and projects were more in-depth.

It was difficult sometimes to understand the question otherwise everything was good.

had major issues with the math to programming part of the lessons. lessons covered the general concept that weeek, did not include a worked example and then just assumed the student knew enough about programming to translate into a programming environment. having a lecture at the end of the week that could go over an entire example from the problem to solve, to the math worked out by hand, to the programed solution with it flown in the sim, would really solidify the programming. also the automatic grader for coding made it tough for a novice programmer, telling me there is an error in the code doesn't help me to write better code, i need to know what i did wrong. also math by video is always a tough way to learn, having a problem set (not graded but available for practice with an answer key and a few worked examples) would help enormously.

Kalman filter was applied but not explain.

Maybe more examples in the PDF , to clarify some concepts . Sometimes the theory is clear but I had some problems to use it to solve problems.

I would really like to repeat this course and after that, also take up the next advanced course offered by TUM (like specific applications of autonomous flying robots as shown in the videos).

I want you to some howework guide line or hint to solve these assignment by themselves.

All right ..!

The lack of practical information: How to configure ROS. How to use markers in the real world. How to set the PS3 controller via Bluetooth.

1.More exercises based on lectures. 2.Access to full python code so can debug easily my code on my computer. Difficult to find errors and understand what code is doing using web browser for coding. 3.Whilst I appreciate the efforts of Daniel and Jurgen their teaching style could be improved. Some great lecturers have the ability to explain material from the perspective of the student and knowing where the difficulties lie. I found I needed to find alternative sources of information to help solidify the material.

It would be good if the lectures and homework are more related!

The lectures are very hard to listen to, lots of 'um's and 'ah's The slides for the lectures are hard to follow while your watching the lecture, please use more visual aids to indicate which formula you are talking about, or some other means to indicate what your referring to while your talking about it. The i found the lectures to be disconnected or weakly connected to the exercises. the depth the lectures goes into, vs the depth the exercises goes into is vastly different. please make the exercises

cover more of the material of the lecture. also the multiple choice and short answer questions generally seem to exist to trip people up, and not to re-enforce knowledge learned from the lectures.

more quizzes /check questions during the video lectures to be sure the students have understand the contents. maby spend some few minutes in generat to explain the simulation interface callback methods etc. for the student to understand the structure of the python interface. Maby som more dialog with the professors - maby weeky announcement about the progress.

Coding in python was the main bottleneck. There should be API's in other languages too!

1) Dr. Jürgen has passed to me his enthusiasm for the subject, and I thank him very much! However I think he could be more focused when he is explaining in the lectures. The way he talks could be more objective. 2) I had no previous knowledge of python and most of the time I lost in the homeworks was due to difficulties in using the vectorial data structures of numpy and the peculiar syntax of python. I think that the code snippets were not representative enough. A practice of python in week 1 would improve the course a lot. Less than a tutorial, just code examples dealing with vectors and matrices using numpy, specially involving operations that are needed subsequently.

The exercises are very difficult and are not explained in the lecture videos.

The class starts off fairly simple and does not ramp up that much in challenge. I feel like the programming assignments have us transposing equations from the lecture onto python code. There is no need for real understanding to complete the homework.

more detailed and thorough explanation of the material

Besides implementing single functions of a problem add some questions to make sure the rest of the code is clear as well.

Programming exercises can be made a little tougher by making the students to initialize all the required variables in the Kalman filter exercise.

For me the practices was too easy. Looking at the theory I was afaid how the practice would be, but finally it was only writing 2 or 3 lines. I think it would be good that we had to do some more work from the practice starting point. I had never used python before. The main dificulty for me was learning python and understanding the code that was already done and how to use it. Python doesn't look a difficult languaje and probably a small guide of 2 or 3 pages with the basics and the functions that we use (from "if" and "for" loop to basic math and np function) would help a lot the sutudents that have never program in python.

Instead of an web based WebGL simulator, an offline such as V-REP with real time scenarios has be more helpful and shall good provide better experience. Also the webased simulator takes time to load and needs to remain online

make a section with reading material for every lecture.

I think the course is perfect, in accordance with its scope.

The exercises were too difficult to perform because during the readings only it shown theory. For the exercise, you need lot of knowledge about Python. It would be advisable that was not so great the gap between theory and Python.

It would be great if we can download slides of lectures. In WebGL simulator you should change your crystal ball interface. Sometimes it was really hard to deal with it. Maybe, it might be replaced with keyboard to some extent. To my mind, tasks were too easy. In last three weeks almost all work was done by staff. Maybe, if you make tasks harder but at the same time you split them on smaller parts it will be more challenging to perform them. As example, you may look at this archived course here on Edx: CS188.1x Artificial Intelligence. There you need to accomplish a big and sometimes difficult task but it is splitted in several parts

The lecture videos could be a bit better. Speech is not fluent and on the hard stuff it was difficult to follow. Especially the Kalman-Filter I would not have understood if i wouldn't have found the SLAM course of Cyrill Stachniss, which is really good! https://www.youtube.com/playlist?list=PLgnQpQtFTOGQrZ4O5QzbIHgl3b1JHimN_

More exercises.

Coming into the course, I had never encountered projective geometry before. I found it difficult to learn based solely on the video lectures. I think that an additional set of practice exercises beyond what was provided in the homework, for extra study ,would be useful. I followed up with some of the recommended readings and those were somewhat useful (in particular Szeliski 2010), but I still have only a superficial understanding of the mathematics behind the technique--that is, I understand the concept well and why it is needed, but feel like my ability to recognize when to apply the concepts and precisely how in a novel situation is relatively weak.

not at this moment, i still need to understand some ideas explained in the class

The course was an awesome learning experience but I wish to see some more topics covered in this course with more explanation and projects.

Section 3 was extremely difficult. Better explanations or more guided exercises would be helpful. Caution future students that Python proficiency is recommended to do well in the exercises. The instructor in Week 2 needs to speak faster in the videos. More exercises to get the quadrotor to do things (that was my big motivation)

Simulator is awesome! It visualized what I code, helped me a lot.

1. Improve presentation skills of lecturer: more fluent and vivid language, better explanations, point at things on the slides you are talking about. 2. More examples for difficult theoretical formulas. 3. All topics of lectures should also be in the exercises. 3. Do lectures in a real class like in 7.00x Introduction to Biology by Prof. Lander. Feels much much better!

The lectures are not helping, overall when you redirect to external material because you are not covering some concepts. the mathematical concepts, some times, are not clear enought. Learning by doing would be my best suggestion.

-divide into smaller subjects -make a 5 min intro of how to work with the parrot AR drone(a very basic quick example, -sponsoring

It seems that more presence of staff in the discussion forums would have been better. Perhaps you might consider assigning CTAs (Community Teaching Assistants) for later offerings of the course. I look forward to other new course offerings from you on Robotics, Computer Vision, Image Processing, etc.

The homework of each week can be more challenge. Maybe some optional homework can make the course more flexible, cause Flying robot is a big topic to cover. And maybe some open hardware guide will be wonderful.

(Optional) offline "simulator": the WebGL one was problematic.

I suggest including more examples and more details on the math parts (not the "common sense" mathematics, but the control/system theory and even on the usage of kinematics theorems/formulas).

Sometimes the questions of the python assignments were not clear enough - for example, telling too much information that is not needed or is only partially needed, et cetera. The course is pretty good, anyway, I plan to use the stuff I learned for my projects.

This would go well with a Computer Vision course (I realise you offer one, but I mean for those of us who don't speak German). Ideally, I think this would be better split up. A short course that encompassed the transforms and pin-hole camera model, maybe something with Kalman filtering, and then the Quadcopter course tieing it all together. That way you could also go much further. For some of the material, it would have been good to have some other resources linked for those of us who are rusty. Unlike University, where you go from one subject into the next, some of us haven't learnt this material in 10 or 20 years. Also, I've never programmed in Python before, so that added quite a level of difficulty to the assignments. The assignments were OK, but we never got a sense of how they fit in with the quad copter, as most of the work was done "behind the scenes". It would have been good to see the whole flow of control and know what was calling when and why. I never got a sense of this. Debugging was almost impossible! Combine this with never having done Python before, and this added hours of frustration. Using print() would all but hang the interpreter. If there was a way we could try this offline, so as to use a debugger, that would be great, or adding some sort of variable watching or code stepping (I know - tough on a web site). The course was the right length (about), but I feel like there was more that could be done. Maybe a sequel?

no

It would be nice to have some explanation of how to implement certain functions in Python. About 40~60% of the time I spent in programming assignments was dedicated to learn how to implement things in this language.

please make courses more precise

Maybe what you did almost at the end. Adding a little bit more of examples.

The offline simulator is 'must' due so many chrashes/slow responses of web based simulator, also how to debug python code needs to be improved as the print/display window should be bigger or resizable (only few lines can be seen) . .

I am interested to build one from the start with minimum simulation required. but the

the building concept can be elaborated more by providing circuit connections and parts joining.

Perhaps some extra material tying to real world implementations on, say, the ARDrone platform

Maybe a marker being use over slides simultaneously with the talk could be helpful, like a teacher does on a board at classroom. Also, for limited guys like me, some more hints or directions to solution for the programming exercises can save time and white hair. Once more, congratulations and many thanks.

Make a "sequel" or QuadNav 2.0 where you can further describe other concepts and broaden the understanding in various field you're working with at Zürich. Thanks for an excellent course.

My suggestions is subtitles in spanish and other language please, It was very dificult by the language Thank you

The only thing I found a bit frustrating was in the use of the online simulator. The "stop" button was unreliable as I'd have to click scores and scores of times to get the simulation to stop. I also found myself wondering about the structure of the Python code used in homework assignments 6 and 7, e.g., how and why the code functions were structured the way they were and what other code is connecting to them to produce the simulation. In other words, it's an unsettling mystery to me how to go from simulation to implementation with an actual AR Drone.

I think the major problem for me and other stundats is the Python language. I'd alredy programmed in C, C++, C# and others, but Python is very new for me. Hence, I need to expend a lot of time searching commands and how to use in another web sites. A good ideia to solve this is to have a little guide (as a week 0 or something) with the main commands, functions and operations of the Python language. You did that in 2 texts, but the 2 are hard to find (i think one is in the middle of week2 exercises and the other i just can't remember). I think if it was available as a week topic (like in the Autonomou Mobile robots course for Matlab language) it would be VERY useufull.

Bevor man einen Film dreht, schaut man sich einen im Kino an. Systematisches Unverständnis von MOOCs. Ich rate jedem Professor der TU selbst mal 5 Kurse abzuschließen. Ich hatte die Möglichkeit bei Harvard an einem SPOC teilzunehmen: 60% meiner Kommilitonen waren selbst Professoren!

Use fucking java or c++. Not python!!!!!

I think a few of the quiz questions could be a bit better worded - some were a bit confusing as to what was being asked.

Some of the python exercises were not well explained.

It will be great if we could build a real quadrotor from scratch during this course. You may also want to consider to add quadrotor dynamic modeling (6DoF) and simulation in the future.

Please, improve the lectures. I think almost all are not good lectures. They are a little hard to follow, and I hate lectures in which the teacher reads what the slides

say. I would like that more exercises are included before homework.

It would be nice to be able to run the simulator offline. Scrolling up and down all the time to run things is a pain. The simulator would slow and eventually freeze the page if you logged much information to STDERR. It might be nice to have more depth and less breadth. In the programming exercises I felt that sometimes I was just filling in the blanks which didn't give me a full understanding of the material. It would perhaps be better to cover less topics but cover them in more detail.

I clearly felt that the course was tailored for the undergraduate student demographic. Granted, this was stated in the first lecture. However, since edx allows people with much more diverse backgrounds to enroll I would propose to adjust the focus with respect to that. I think that a good deal, even though not the majority, of participants are university grads but are already in their careers for years. The lectures tried to convey a lot of mathematical information. I had the feeling that the slides were a little overloaded in that respect. It is not the content itself but the way it was displayed. Looking at slides 2 days after viewing the videos felt like looking into one of those formula-collections used in exams at times where the formula is there but the context and meaning is missing. Exercises and lecture material felt a bit disconnected at times. Some exercises had a lengthy math prelude but the implementation was a one-liner. Again, it is not the content but rather a minor lack of "smoothness" in the material. Flight simulator: Allow control via keyboard input (arrow keys for camera panning etc.)

More examples

the Mathematic classes was a little hard to understand

Next time add more sessions on practical architectural designing of flying robots.If possible deliver requisite materials to students for more practical exposure,with requisite amount.

My linear algebra was too rusty and I was not able to get it up to speed in time. I was mostly lost in the second week, but the homework seemed to get easier after that and I was able to finish without any problems. Unfortunately, eight weeks was not enough time for the material. In hindsight, I would have preferred to take a separate linear algebra class and then have this class waste no time on math. I do not think the quick math review was of any use. Overall, I am happy with the class. Thanks!

more simulations/examples maybe more on ROS and ar.drone ? Thanks - very very interesting.

Exercise were sometimes unclear. I spent more time with determining what shall I do, then actually solving the task.

The exercises could be done without knowledge of the material, simply from reading the slides and transfering the information 1:1 to the assignment. Maybe there could be some questions geared more to understanding and real knowledge (ex. see H12-H13.....) The Forum is hard to read and search (Edx Platform, for a good example see coursera platform)

Open source hardware, Raspberry Pi, ROS A little more about the basics of python in this environment.

I am not used to python I solved most exercises by trial and error some exercises with odometrie software would be helpfull

No Suggestions. I request though , I am working currently in a very renown company, but I want to pursue what you guys are teaching as a Masters course. Please let me know if you guys can help me get an admission in TUM. Well done guys. Keep the up. :)

Give references to papers, books and lectures to better cope with the heavy math theory that lies behind the topic. A second, practical, course with hands on a real quadcopter would be a great followup to this course! Thanks and compliments to TUM!!!

overall, course was good... :-)

Regarding the prerequisites, I think the "Linear Algebra" requirement generates some misunderstanding and miss expectations ... to follow the course it is needed a bit of background in "computer graphics math" which in general is not covered in linear algebra courses. I believe some additional material is needed in this area.

Some emulators were not working on Linux, I should switch to Windows to get some points... It would be nice to get it fixed.

Add minihomeworks, practices, and introductory excercises to the homeworks in order to increase the knowledge.

A few more exercise/homework would be good to enhance the learning and understanding of the course materials. The programming work should have been broken down into smaller steps. Please show the answer for the homework 8 as I really don't know how to do it. An inclusion on using ROS, or better yet, using ROS as the base of teaching this course would even be better. If the course includes using ROS, I would definitely invest in a quadcopter.. Thanks

more difficult programming excersises

I think that I struggled a little more than I had expected with the Python programming aspects. I would suggest that perhaps a simple python "pre-course" would be very helpful for us non-programmers. It would prevent a lot of anxious rummaging through the interwebs in search of python knowledge. I felt I was thrown in the deep end in this regard... but at least I have learned to tread water!

I think giving access to the simulation environment (making it downloadable as a plugin) would be a good idea in order to give the ability to use an IDE such as Eclipse or PyCharm. Writing more complex codes would be a pain in the web based editor, while word completion would give huge advantage.

Covering more advanced topics.

I hope to have a course with more advanced content in robotics such as reenforcement learning.

the lessons are hard, in the sense that they require a strong background in many fields in order to understand all the implications of the lecture. this is good if one wants an overview, but are really concise if one wants to deeply understand the topic without prior knowledge. On the other hand, with minimal experience in python

programming, homeworks are generally really easy. It could maybe be useful to balance lessons and homework effort.

I think it is possible to extend the course and explain more detailed the topics.

I had to shop around, eventually finding a Mac that could run the simulator adequately well. I do not use Windows, and the simulator did not give me good performance on an Ubuntu laptop I normally use (Linux machines are notoriously bad for 3D). In terms of the lectures, the first week was what I expect in an EdX course - interleaved lecture videos and questions that help re-enforce the covered material. I find this helpful when approaching the homework - there's examples in the video and example calculations and formulae in the between-video sections to draw from. More than once as the course went on, I struggled to switch between terminology/labels used in the lecture and used in the code (x_predicted vs mu-bar, for example). I think doing more work between the lectures could have helped instill a deeper understanding of the mechanics involved.

More example on Python, more example on Kalman

Just in the software side, I would include a little description of the software's architecture. Perhaps a class diagram or a flow chart, just to get an idea on how the lecture's material is related to the implementation. Anyway, I should be thankful for all the nice work you put into the course. Regards, DSG

I would like to see discussions of the homework rather than just answers for the programming section. Personally I struggled a bit with the programming parts as I am not familiar with Python but have some c++ knowledge and experience. I also found it challenging to first visualize the data given, yet again this could have been easier if I had a better background of Python. With all this said I think my suggestion regarding the programming part would be to rather test the understanding of the data flow rather than the ability to program in a particular language. Maybe using flow diagrams instead.. ?

I would like to suggest to use MATLAB in this course. Python is self is not so easy to debug programs in on the edX. I spent a lot of time to find bugs to use print function but very tedious.

Some of the homework was a bit easy - many just involved adding in a line or two of code, and it was often just copying some equation from the lecture. The final assignment was great, but most of the others didn't really require much thinking I felt.

More Focus on Exempels and Programming (80%) math. only as background info (20%)

could not download the lectures easily on my android nexus 7 tablet... on clicking the download link it always opened the video on the tablet instead of downloading it.. this severely impacted my engagement with the course lectures (was restricted to watching lectures on pc at home in the evenings and late at nights) instead of watching them on the commute to work and elsewhere... this led me to lag behind with homework submissions.

Make the videos shorter by cutting thru segments.

I don't have the feeling I have advanced much. I am aware that designing exercises is a tough task, but I think the exercises should require bigger effort

1. Thanks for the staff and TA help. 2. I would like to add the more material to describe the hardware principal and how to assembly and tuning the quadrotor

I will miss this course. I wish there were some more topics. Is there room for an "advanced course" that picks up where this one stops? In any case, I am very happy with this course and I wish to thank everybody who made it possible. Kind rergards, Johan (Belgium)

The deadlines should not be at the end of the course, but weekly. Maybe with a grace period at the beginning as in other courses. The homework questions need to be improved. Not well explained, require a great effort in guessing what it means, than working on the subject. The overall level of the course needs to increase. Certaing matters, such as Algebra, Probability, are full week's topic, but they could well be posted as Aditional material aside from videos or evaluations, giving more room to more interesting material. You could for example be more in-depth on PID Regulators, for example. There is no programming explanation. For someone like me with a few Python experience, it was difficult to program the exercises. You have to explain also how to program the Parrot. I bought it and I have no clue on how to deal with it.

Make videos where taught to use the commands to the quadrotors.

Perhaps allow a bit more time for assignment eight.

Explain with much more detail the subjects matter and with practical examples (ex: solved exercises). The subjects matter are to much complex in order to be explained in short videos of 20 minutes.

A bigger project that involved submitting actual python code (outside of the simulator). More than just fill in the blanks coding.. I realize this poses a problem for grading but I feel like until I do an actual project with ROS (which I plan on doing!) everything won't fully sink in.

Should be a bit more challenging. I had assumed it would be an intermediate or advanced class. A lot of the lectures seemed like 'intro to robotics' stuff. (coordinate systems, vectors, probability review, etc). If offered again in the same vein, perhaps calling the class "An introduction to Robotics and Quadrotors". This would make clearer that it's more of an intro course. To me "autonomous navigation" implied the more complex materials of feature detection, SLAM, path planning, and the parts of robotics more specific to Quadrotors such as motion estimation, etc. A lot of these more advanced topics were lightly touched on, but not covered extensively in the programming assignments. I did enjoy the class and would like to thank you for the time and effort you put into preparing and teaching it.

I spent a lot of time trying to understand some of the logic behind the homework exercises (Python programming) because it was not clear how they were being evaluated so eventually I managed by trial and error

It would be useful to impletent these concepts in practice (for those with quadrotors), to extent the hard topic of computer vision and kahlman filter, to give some math

needed (the pace at which kahlman filter was introduced was too high for many - didn't cache a thing), divide lectures into categories (hard too look for 30 min a lecture at one time), make them more interactive (more interesting practice exercises), hard topic with lots of background and variables should be divided and not covered in one week. I think this course should be about 12 weeks with 5-10 lectures per week much more practice with quadrotor and exercies.

It would be great if you add another lecture about the hardware.

I would like a longer course with more material, information and exercises.

Spoken English of the Lecturer was a bit shaky. A little more fluency in english can greatly improve the quality of lecture videos. The course content was good but the presentation could have been in more detail, especially the lectures on Filter theory and Visual odometery. The content on these topics was too difficult to understand in just 2 weeks. The exercises could have been made more challenging. We only had to write 2/3 lines of code to get through. I know that this motivates the beginners , so that they do not lose hope.

I think this feedback page needs to be redesigned

Use the video lectures to actually teach the concepts. Derive and explain the things that are used in practice.

Much of the course, mainly programming issues, are left under the hood. This can be helpful to gain a clean interface without many things dragging our attention but it also enclosures the working principles that would be very welcome to gain greater knowledge about the inner physical issues.

lower the homework difficulty

Include programming lessons.

Would have liked to see more on autonomy. This was more low-level on the robotics part of things. Very little in here focussed on flying (as opposed to wheeled) robots.

The Kalman filter chapter I think could be better explained.

The progress graphic showed an x on week eight, and the topic for the week was pre-announced to be a review of advanced research on navigation. Week 7 I fell slightly behind and traveled for two days early in week 8. But I thought it would be no problem as I believed there would be no home work for week 8. I was surprised to find that there was an assignment. After I viewed the lectures and read the papers (looks like a breakthrough in SLAM navigation!) I only had two evenings to complete the assignment. At that point I discovered the difficulty had shot up significantly in the final week. I am sure you think it is a simple copy-paste exercise, but it is more complex than any other assignment in coding, debugging, and then optimizing the solution. There should be more time, at the very least two weeks, to do the final assignment. I know there are similar comments coming from other students.

1. Make more and better videos covering more material. 2. Have more homework exercises covering more material. 3. Show many worked homework exercises in your lectures. 4. Provide at least some answers of homework problems. 5. Professors or teaching assistants should answer more discussion forum questions.

6. Don't put out a course on edx when you aren't going to teach much or support the class much.

Less math.

Temper the shock for those low on prerequisites by providing references to quality tutorials on basic principles.

It might be useful and student-friendly to state clearly within the homeworks what parts of the whole project do we focus on by keeping track of the different parts, and where each homework lies, in a giant block scheme (in French : "schéma-blocs", I am sorry if I am not quite understandable...) of the whole project.

I have few suggestions: 1) Lectures are heavily packed with equations and little explanations. My suggestion is to elaborate smaller (simpler) in class examples (using Python) to show the implementation of those concepts. 2) Homework Codes are very not very well documented in terms of explanations inside or outside the code. For example, the command "To Do: Play with Noise Matrices" is not very clear, and it doesn't show any learning potential from itself. Maybe a better explanation about the Noise Matrices before its implementation would have been more insightful. 3) More active Staff, I know this is a free course and I understand the amount of students that might be enrolled, but try to have a more structured way of differencing between discussions that require Staff attention and others that do not need Staff attention. This eventually might be helpful to avoid people posting their solutions and violating the honor codes.

The editor frame in the programming assignments needs some improvement, as is limited in size therefore making it difficult to use even on a large screen. Also, it would be useful to be able to save the code at any point without the demands that the simulator has had to run over a certain number of seconds before the work can be saved.

- staff and admins need to do a better job of monitoring the discussion forum and enforcing the honor code.

The step to introduce the bayes and kalman filtering should be extended more. I learned a lot, how it's implemented, but sometimes the "why" was missing or not understand by me. Especially the EKF setup was not clear enough, that i could transfer it to another problem.

please next time give some pointers towards a cheap DIY quadroter kit along with the course... Edx should come up with android app like coursera... helps a lot to watch the lectures standing in queses and while commuting to work

exercises are a bit ambiguous, need to be more clearly explained on what to do.

My only feedback centres around the homeworks for weeks 5 to 7, which I thought were wayy too easy compared to the lecture contents for these weeks (homeworks 1 to 4 were excellent in this respect). I would recommend the homeworks for these weeks to *specifically* tackle weeks 5 to 7's lecture contents.... so that people's understanding is solid before going to homeworks 7 or 8.

Add a week on a flying robot filming a moving object (man, animal, other vehicle...). cf https://www.kickstarter.com/projects/sqdr/hexo-your-autonomous-aerial-camera

more examples, more explanations, more clarifications, show how to build a real quad-copter, more instances, more examples, more clarifications, more explanations, more explanations about the concepts...

Some parts of the Kalman filter was not explained well, I had to look into other resources to grasp that part. A better description of the lab environment - available methods for graphs etc The simulator was a bit difficult to navigate using a laptop only. Alternative keys for zooming etc other than mouse would have been useful

More challenging homework would be nicer for students to be motivated to review and strength knowledge for the class.

- More competition exercises. -

More emulator tasks:)

I believe that an 8 week course did not do this topic justice I think the course should be longer so that more explanation and examples could be incorporated

- Exercises are sometimes quite simple to complete and sometimes very hard to complete. The last assignment is much more difficult than the previous one. The tricky bit is explained below. - The quadrocopter simulation is a good tool for doing assignments. However, the environment is set up not the same throughout the course, therefore it's very difficult to understand how the whole system function. - When I watch the lecture videos on my Nexus 7 tablet, the subtitles block part of the text on the slide. This problem is very annoying as I cannot turn off subtitle on my Nexus 7.

Add some references to definitions etc. Especially the Week 3 with the rotations matrices were a bit vague (and later on found erroneous) and properties there of.

More exercises

The should have been judiciously punctuated by chunks of assignments focussing on developing more realization of the concepts. This would make it wonderful. It would be even more great if hands on realization is given mathematical mechanism of correction and prediction

The excercise is quite easy therefore, we dont really have oppurtunity to elaborate or to implement the overall knowledge gained in the lecture

Number of daily responses