Kursanalys - KTH[1]

Formulär för kursansvarig.
Kursanalysen utförs under kursens gång.
Nomenklatur: F – föreläsning, Ö – övning, R – räknestuga, L – laboration, S – seminarium)

KURSDATA Obligatorisk del [2]

Kursens namn	**Kursnummer**
Applied Estimation (Tillämpad estimering)	EL2320 / FEL3320
Kurspoäng och poäng fördelat på exam-former	**När kursen genomfördes**
7,5hp • TEN1 3,5hp • PRO1 2hp (EKF) • PRO2 2hp (PF)	2nd quarter 09/10
Kursansvarig och övriga lärare	**Undervisningstimmar, fördelat på F, Ö, R, L, S**
Patric Jensfelt Omid Aghazadeh	F: 24h, R: 23h

Antal registrerade studenter	30 + (3 PhD students)
Prestationsgrad efter 1:a examenstillfället, i %	80%
Examinationsgrad efter 1:a examenstillfället, i %	70%

MÅL

Ange övergripande målen för kursen

The goal with this course is that the student should know the theory behind and be able to apply (through hands-on experience) the (Extended) Kalman Filter and Particle Filter to solve estimation problems. The student should also have a basic knowledge about other estimation methods such as the Unscented Kalman Filter (UKF), Rao-Blackwellized Particle Filter (RBPF) which are a commonly used estimation methods today. The ability to apply the estimation methods presented in the course will be tested with the labs and the project assignments and the theory will be tested with the exam and the project.

Ange hur kursen är utformad för att uppfylla målen

The course mixes lectures where the underlying theory and some tips regarding important considerations when applying this theory is introduced with labs/projects where the students get to apply the knowledge on concrete and realistic problems.

Eventuellt deltagande i länkmöte före kursstart

Synpunkter från detta

[1] Instruktioner till kursanalysformulär sist i dokumentet
[2] Rektors beslut: http://www.kth.se/info/kth-handboken/II/12/1.html

Kursens pedagogiska utveckling I

Beskriv de förändringar som gjorts sedan förra kursomgången. (Berätta även för studenterna vid kursstart)

Kontakt med studenterna under kursens gång

Studenter i årets kurs-nämnd:	Namn	E-post (lämnas blank vid webbpublicering)
	Navid Khajeh Mahabadi	**navidkm@kth.se**
	Thomas Johansson	**thojoha@kth.se**

Resultat av formativ mittkursenkät	Please see attach mid review at the end.
Resultat av kursmöten	

Kontakt med övriga lärare under kursens gång

Kommentarer

Kursenkät; teknologernas synpunkter Obligatorisk del [3]

Att komma ihåg:
1) Uppmana, mha kursnämnden, till ifyllande av kursenkät i anslutning till / just efter slutexaminationen
2) Delge kursnämnden enkäten
3) Publicera enkäten under en kortare tid

Period, då enkäten var aktiv	2010-02-18 – 2010-03-11
Frågor, som adderades till standardfrågorna	The entire course evaluation is attached
Svarsfrekvens	24 out of 33 students answered
Förändringar sedan förra genomförandet	
Helhetsintryck	Overall rather positive response from the students. The biggest complaint was the labs, which took too much time.
Relevanta webb-länkar	

Kursansvarigs tolkning av enkät

Positiva synpunkter	
Negativa synpunkter	
Var kursen relevant i förhållande till kursmålen?	yes
Syn på förkunskaperna	I think that overall students had enough prior knowledge
Syn på undervisningsformen	Lectures good in general. The labs where too demanding.
Syn på kurslitt/kursmaterial	The course book is a bit too big and covers a bit more than necessary but the interested students like it because it provides a lot of help with the projects

[3] Rektors beslut: http://www.kth.se/info/kth-handboken/II/12/1.html

Syn på examinationen	Although the majority say that the grading rules where clear I think that there were a number of students that did not understand that no matter how well you do on the exam you only get an E unless you make a project as well.
Speciellt intressanta kommentarer	One student did not like the lectures at all but did not offer a concrete example on how to change to make it beter.

Synpunkter från övriga lärare efter avslutad kurs

Vad fungerade bra	The students are well satisfied with the lectures. The exam is good. [PJ comment: The aim is to test the basic understanding so it is quite different from the typical exams that try to test for grades A-F.]

Vad fungerade mindre bra	The content of the course is not completely clear for some students. Maybe it is good to dedicate more time for the "motivational" lecture(the first lecture). It definitely makes much more sense to spend more time motivating and describing the lab assignments as I will mention later on. The changes we made for grading. Some say it was a little harsh to compute a minimum. Some did not appreciate being "free" to submit a project and thoughtif they do well on the exam, they would get a good grade anyway! Students were less impressed with the labs. The labs were compulsory compared to the previous year's(it was compulsory back then, but some did not do labs at all last year!). There were some complications regarding the labs which can be improved this year. Both year, at leas one student complained about the PF lab being the same as the KF lab(localization). In my opinion, this is exactly a good thing as the students can compare the strengths and weaknesses of each algorithm in exactly one problem that they study in depth! On the other hand, for the students who are not attracted to the localization problem, this might be boring. It makes sense to change the second lab from PF localization to some other lab e.g. extend the warm up part. It also makes sense to improve the labs as I will mention later on. This year, students liked the PF lab much less than KF one. I think the most important reason for this is the inefficient implementations of the PF(everyone (that attended the help sessions) used for-loops over particles which runs extremely slow on matlab if there are 10,000 particles). I spent one complete session to teach everyone how to vectorize everything(although a complete sample was available in the warmup part, it seems that it was not enough) and have a speed-up factor of at least 10! I strongly recommend considering one extra lab-lecture for the implementation of the PF in matlab(and some other vector and matrix algebra and their implementation in matlab)! I will mention this later on.

Resultat av kursnämndsmöte efter examination

Studenternas sammanfattn.

Förslag till förändringar	1. Make a typical KF problem an exercise which the TA solves during a tutorial session. Something similar can be done with a simple PF. Also it might be a good idea to hold the help sessions publicly since many students have common doubts. 2. Clarify the grading system, Also, the final grade is the minimum of the exam and the project. 3. Reschedule the labs and project so that the project could be started during the period. 4. Guest lecturers might not concentrate on the theory but more show practical implementations/results and how their proposals work in real systems. 5.Clarify that Bilda surveys are anonymous to convince/persuade the students to take part. 6. Introduce a specific lecture that introduces each lab. Also a typical result could be presented so that the students know if they are on the right way.
Länk till kursnämndsprot.	

Kursansvarigs sammanfattande berättelse

Helhetsintryck	The idea with compulsary labs worked well but they were too demanding. The grading rules have to be made much more clear.
Positiva synpunkter	Students like the content of the course overall
Negativa synpunkter	Grading not clear.
Syn på förkunskaperna	People mostly have what they needed but some would have benefited from some more probability theory.
Syn på undervisningsformen	Worked well, expect labs as mentioned above.
Syn på kurslitt/kursmaterial	The book is still the best I can find on the topic although it is a bit too much robotics.
Syn på examinationen	Worked well in "theory" I think but one needs to communicate better how the grading is done and the labs have to be made a bit less demanding so that they actualy correspond to E level as they were intended.

Kursens pedagogiska utveckling II Obligatorisk del [4]

Hur förändringarna till denna kursomgång fungerade	The labs were made mandatory. That worked well in the sense that people did them now. What did not work was that people did not do the project instead. Since the labs were more difficult than expected one grade level bonus was added to each lab so that students that did ver well on them could get a C without a project. Including the grade from the exam into the course grade was a good idea. I still think that the minimum between the exam and project grade is the right way to go given that the exam is quite easy and should not hinder anyone from a high grade and the course is on applied estimation so that people should show through the project that they know how to apply it.

[4] Rektors beslut: http://www.kth.se/info/kth-handboken/II/12/1.html

Förändringar som bör göras inför nästa kursomgång	Make the labs a bit less demanding. Make it very clear that you need to do the project to get a high grade Try to introduce the EKF and PF earlier so that the labs can be handed out earlier and thus completed earlier. One can instead make two rounds for the EKF and PF. Suggest some simpler projects so that the people that do not aim for A can have a well defined path to a C for example. General Suggestions from Omid: - Considering more help sessions in a more efficient way. The later help sessions were more efficient(everyone comes to the computer room and works on their labs and asks questions). They could also help eacho ther if they had the same question and one of them got the answer. - Considering one motivating and introductory lecture for the labs (by the TA). This would save some time for the students not familiar with the problem and motivate it better. - Considering one matlab crash-lecture for the students with insufficient background in matlab programming: How to vectorize computations, how to compute mahalanobis distance, dot product in the vectorized form, clustering (for advanced re-sampling of PF), vector normalization, covariance matrix estimation and etc. The timing for this should be the very beginning of the course. For this purpose, the TA can prepare a document instead of a lecture. Doing both will probably get the best resutls. - Revision of the lab instructions. Removing the questions most of the students answered wrong and ambiguous questions. - Introducing the PF localization as the warm-up part and finding another nice example for the actual lab. Maybe the same vision lab with some modifications on higher dimensions(e.g. 5 dimension state-space: 3 pose, 2 translational and angular velocity).

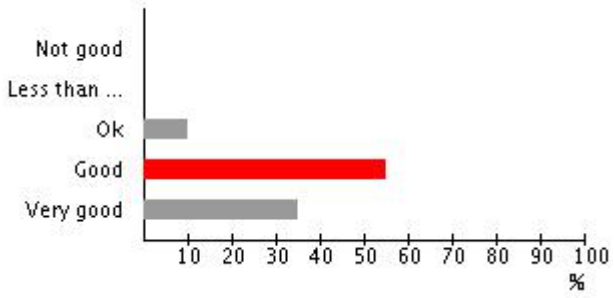
Övrigt

Kommentarer

Survey results

Survey:	Midtime feedback
Status:	closed
Date:	2010-03-21 19:17:51
Group:	Activated participants (EL2320 Applied Estimation H09)
Answered by:	27(39) (69%)

What do you think about the lectures so far?



number	distribution	answer choice
0	0%	Not good
0	0%	Less than good
2	10%	Ok
11	55%	Good
7	35%	Very good

20 has answered of 39 (51%)
Maximum number of choices: 1

Coments on lectures

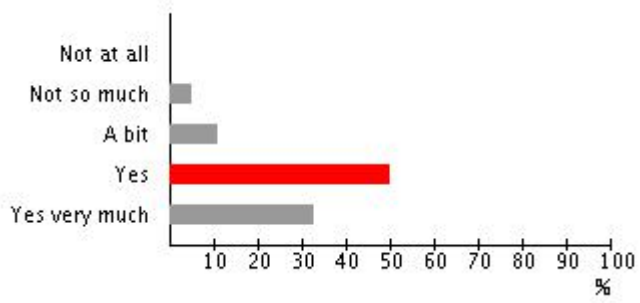
10 has answered of 39 (25%)

Comment:

- The course is a really interesting topic and it seems as if it is so applicable in robotic. The professor's knowledge for this course is deep. To me, the content of the course are not so clarified intuitively. It maybe due to the fact that I have no background about this course...
- Actually I don’t have rich background in estimation filed, except one "Probability and Statistics" elementary course in my bachelor’s degree. This matter might causes I get the main idea in the lectures rarely, therefore I should study more in home and whereas any extra material would not be as effective as understanding in the class, I understood main idea of each lecture more or less up to now.
- The lectures are very good especially if one understand from the beginning, the overall flow of the course.
- I really like the idea of guest-lectures, mostly because it provides motivation, that is much needed after working dozens of hours on Lab1...
- I like that you write on the blackboard instead of using slides etc. The demos are great as well. Perfect mix :)
- I think it would be better if it is presented in a way that a simple but essential problem which led to develop and use of the Kalman Filter be introduced firstly, and then some ways to solve the problem (e.g. least-square method and so on) be presented and then the problem be tried to be solved by using the Kalman Filter step by step so that students

understand WHY we should use the Kalman Filter and also HOW to.
- The course is nice and the structure is easy to get.
- There may be errors in the notes. some terms are not consistent and often leads to confusions. The lecture is sometimes too fast
- Very educational! The topics are explained in a good way, with a perfect mix of theory and examples.
- I think we should have a lab lecture...

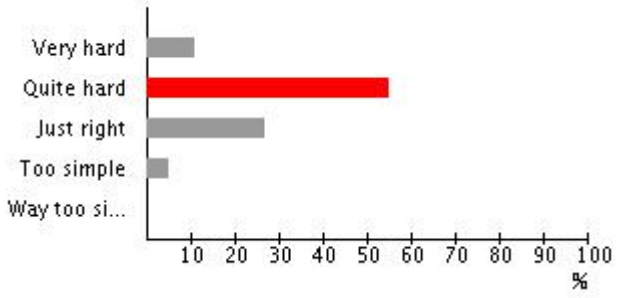
Do you think that the lab assignment help you learn?



number	distribution	answer choice
0	0%	Not at all
1	5,6%	Not so much
2	11,1%	A bit
9	50%	Yes
6	33,3%	Yes very much

18 has answered of 39 (46%)
Maximum number of choices: 1

What do you think of the level of difficulty of the lab assignment?



number	distribution	answer choice
2	11,1%	Very hard
10	55,6%	Quite hard
5	27,8%	Just right
1	5,6%	Too simple
0	0%	Way too simple

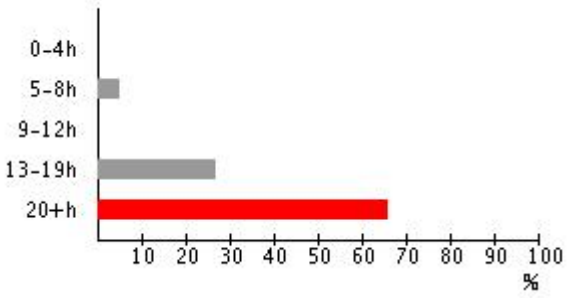
18 has answered of 39 (46%)

Maximum number of choices: 1

Comment:

- The lab1 was simple to do since we were only supposed to implement a described algorithm. The idea that we had to complete the code is just Okey and highly appreciated (since it simplified our tasks and we did not deal with graphical issues...).The warm up part, help me learn how the Kalman filter idea would be applied.
- I think that the main part which helped me to get the idea of EKF in lab 1 (I do not comment on lab 2 because I have not done it yet) was the warm-up part which has a good practical example. The main part is still almost vague for me. I just followed up the instruction to write some MATLAB codes for each function without having enough knowledge and overview of the problem. I think that the writing code of some parts of the main problem which was concerning about graphic of MATLAB has been written for our convenience and it was grateful, however I think that it would be better if we could solve a problem like Kalman filter designing for a car completely by ourselves.
- Problematic: Everything depended on each other, thus it was far too easy to get stuck repeatedly...with often tiny mistakes in the code a second pair of eyes often helps, so maybe this should have been a 2ppl-group task.
- The questions were pretty hard, the code part was good. Maybe some simple testcases should have been included in the beginning.
- In my opinion, the lab 1 description file is not clear and it doesn't have enough detail about the problem. For example, is the Robot's orientation between [0, 2*pi)? or [-pi,pi)? or [0,+inf)? Is it correct to do an assumption and solve the problem? And many other details that unfortunately haven't been mentioned in the Lab 1 document.
- I spent too much time looking for small programmation errors instad of understand in detail what I was doing.
- very vague
- The main difficulty is that it is difficult to debug the code to find errors, since there are no test cases, for which the correct response is known. It is therefore difficult to know if a bad result is due to implementation errors or bad parameter tuning. Having test cases for each function that should be written would make things a lot easier.
- some questions are difficult and I have not got useful related reference...

How much time did you spend on the lab assignment



number	distribution	answer choice
0	0%	0-4h
1	5,6%	5-8h
0	0%	9-12h
5	27,8%	13-19h
12	66,7%	20+h

18 has answered of 39 (46%)
Maximum number of choices: 1

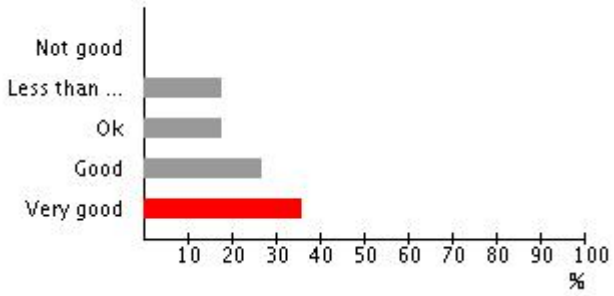
Comments on the lab assignment

10 has answered of 39 (25%)

Comment:

- The reason that it took me a lot of time to do the Lab was due entirely to the fact that I did not know what is required in the problem, I wrote the whole code in 1 day but I spent 3-4 days to figure out what was needed. Also there was a lot of modifications in the problem until 1 day before the extended deadline that makes the goal of the problem somehow vague.
- I have spent more than 20 hours just for understanding the main problem because from lab1 instruction I did not get the main problem. After attending in some help sessions I have almost get some parts of problem the I started to just WRITE the MATLAB codes for each function.
- Hope it will be clarified/solutions discussed sometime in the future.
- Would have been nice to devide it up in two labs. Maybe go with EKF and landmark-association first and introduce outlier detection and batch-associate on top of that same framework later. The idea of filling in functions on a bigger, given framework is an interesting idea though!
- I think it would be better if the lab instrution contains a flow chart about all the code files. Therefore we can undstand the role of each one better. And it would be better if the teacher could explain the lab task for a short time(ie.15 min) on the class before we start.
- Very interesting
- At the beginning of the Lab 1, there was no reference to compare your results with, to see if they are correct or not. But fortunately test cases helped me a lot to debug my code.
- A brief explanation or a lecture on the assignment will help students to get a direction.
- See previous comment.
- It contains too much matlab works.

If you attended a help session. What did you think about the help you got?



number	distribution	answer choice
0	0%	Not good
2	18,2%	Less than good
2	18,2%	Ok
3	27,3%	Good
4	36,4%	Very good

11 has answered of 39 (28%)
Maximum number of choices: 1

Comments about the help sessions

10 has answered of 39 (25%)

Comment:

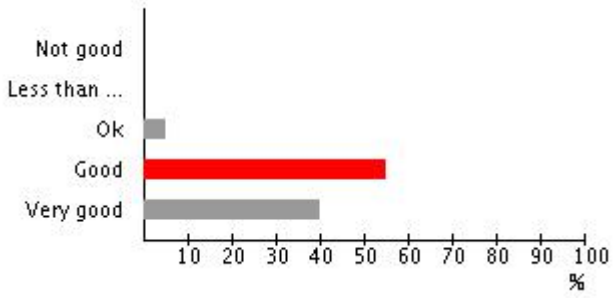
- The teaching assistant was so helpful in the lab sessions.
- Omid really helped me in following the instructions and writing the codes however I am not still satisfied with learning main idea of EKF!
- I didn't attend the help sessions due to timing problem but from what I understand and observed in writing the code I

believe the help sessions could have been really helpful.
- MORE HELP, less sporadic announcements. I personally think it was all too clear from the get go that this would require a lot if help, especially since it was a single-student-task.
- If there is a determined time(for example 3 hour on the morning) when all students do the lab assignment in the computer center and the TA is sitting there. So anyone who get a problem can just ask him. I think this would save a lot time due to the in-time answers instead of staying on some detailed points for a long time.
- Have not attended
- I asked my questions, and also the teaching assistant kindly tried to answer my questions, but unfortunately the answers were not helpful.
- Omid has been very helpful.
- 15 minutes-help session is too short.
- It is very good, I need more help sessions

Survey results

Survey:	Course evaluation
Status:	closed
Date:	2010-03-21 19:29:35
Group:	Activated participants (EL2320 Applied Estimation H09)
Answered by:	24(39) (61%)

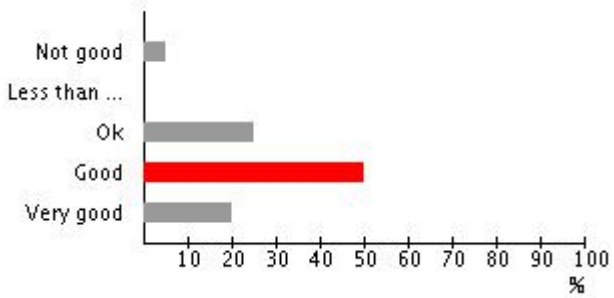
What is your overall impression of the course?



number	distribution	answer choice
0	0%	Not good
0	0%	Less than good
1	5%	Ok
11	55%	Good
8	40%	Very good

20 has answered of 39 (51%)
Maximum number of choices: 1

Where the goals and content of the course made clear from the start?

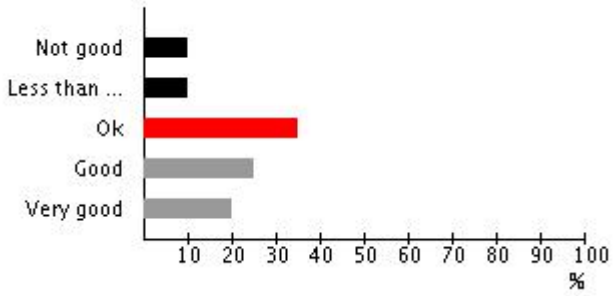


number	distribution	answer choice
1	5%	Not good
0	0%	Less than good
5	25%	Ok

10	50%	Good
4	20%	Very good

20 has answered of 39 (51%)
Maximum number of choices: 1

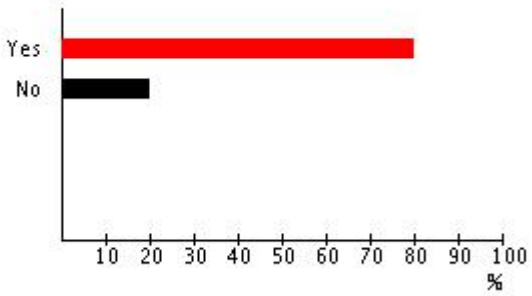
The rules form grading were presented on the web and at the first lecture. Do you think that they were communicated clearly?



number	distribution	answer choice
2	10%	Not good
2	10%	Less than good
7	35%	Ok
5	25%	Good
4	20%	Very good

20 has answered of 39 (51%)
Maximum number of choices: 1

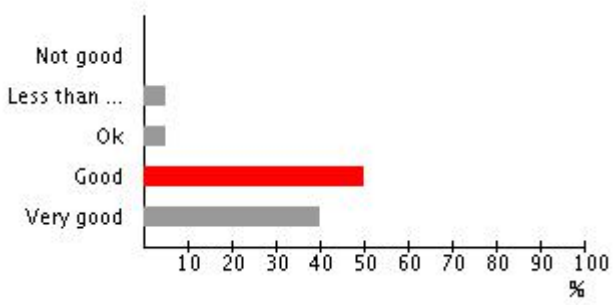
Do you consider your theoretical background sifficient for the course?



number	distribution	answer choice
16	80%	Yes
4	20%	No

20 has answered of 39 (51%)
Maximum number of choices: 1

What did you think about the lectures?



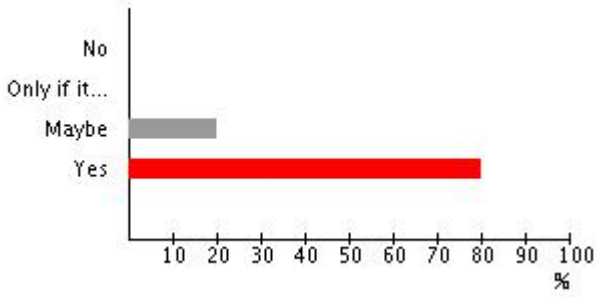
number	distribution	answer choice
0	0%	Not good
1	5%	Less than good
1	5%	Ok
10	50%	Good
8	40%	Very good

20 has answered of 39 (51%)
Maximum number of choices: 1

Comment:

- The labs and project seem to be more difficult than expected, and the help from the teacher and TA is not sifficient
- I like the mix of theory and practice on the lectures.
- It would be better with more practical examples.

Would you say that you now know how to use a Kalman filter for a general problem?



number	distribution	answer choice
0	0%	No
0	0%	Only if it was for localization or SLAM
4	20%	Maybe
16	80%	Yes

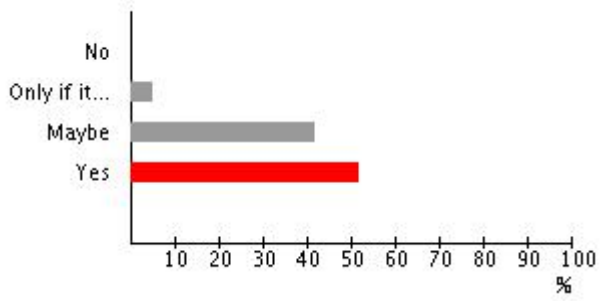
20 has answered of 39 (51%)
Maximum number of choices: 1

Comment:

- But I do

- Maybe it would be better if we can see some other practical application of KF in other feild, how to use it in a closed loop control system, for example.
- I can not sit down and implement a Kalman filter without having to look at the lecture notes.
- I feel that Kalman filter is used everywhere...

Would you say that you now know how to use a Particle filter for a general problem?



number	distribution	answer choice
0	0%	No
1	5,3%	Only if it is about localization
8	42,1%	Maybe
10	52,6%	Yes

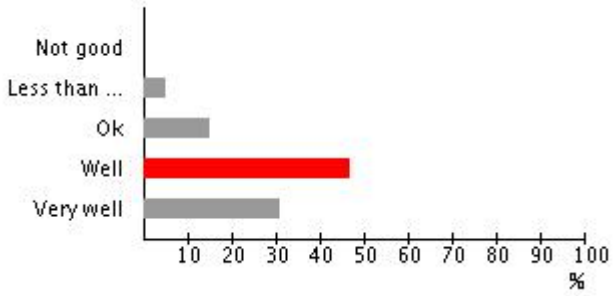
19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- See above
- For Particle filter, many points are not easy to understand

---

An idea with the course was to illustrate some techniques in robotics in addition to estimation. How well do you think that this worked overall?



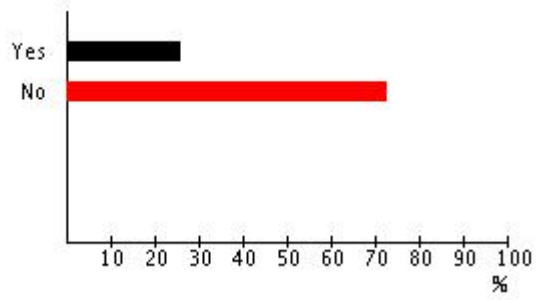
number	distribution	answer choice
0	0%	Not good
1	5,3%	Less than good
3	15,8%	Ok
9	47,4%	Well
6	31,6%	Very well

19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- I think estimations are not enough for this course

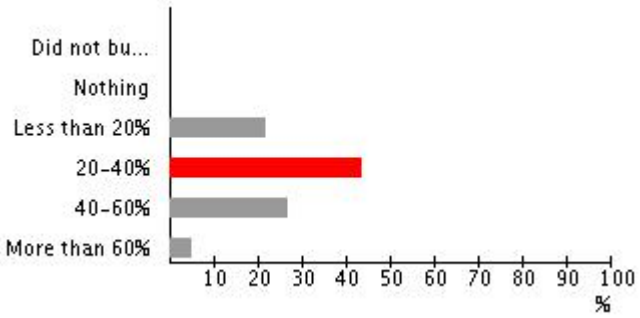
Did you buy the course book (Probabilistic Robotics)?



number	distribution	answer choice
5	26,3%	Yes
14	73,7%	No

19 has answered of 39 (48%)
Maximum number of choices: 1

How much of the course book did you read?



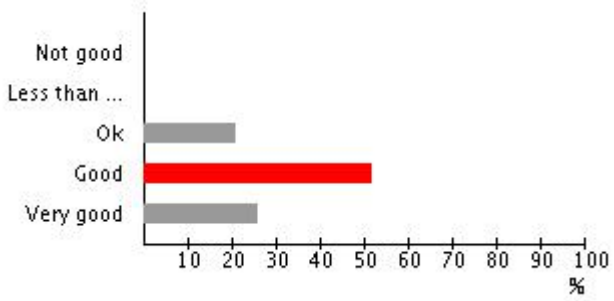
number	distribution	answer choice
0	0%	Did not buy it
0	0%	Nothing
4	22,2%	Less than 20%
8	44,4%	20-40%
5	27,8%	40-60%
1	5,6%	More than 60%

18 has answered of 39 (46%)
Maximum number of choices: 1

Comment:

- Recommended readings.
- The book itself is too thick. I just read the part which is useful to the project and labs.
- These references in BILDA are very helpful
- I got electronic file of the course book from the web and read less than 20% of that, I think that the lectures were enough for understanding the main idea.

Do you think that the exam tested what was taught in the course?



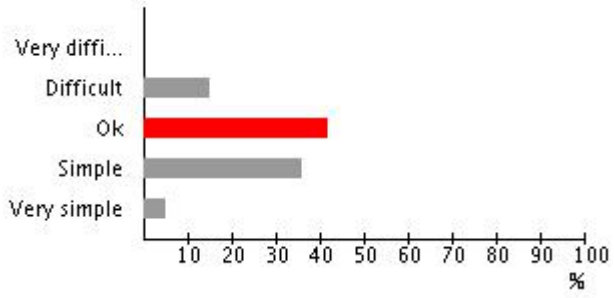
number	distribution	answer choice
0	0%	Not good
0	0%	Less than good
4	21,1%	Ok
10	52,6%	Good
5	26,3%	Very good

19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- It is very necessary to have this kind of test.

How difficult did you find the exam?



number	distribution	answer choice
0	0%	Very difficult
3	15,8%	Difficult

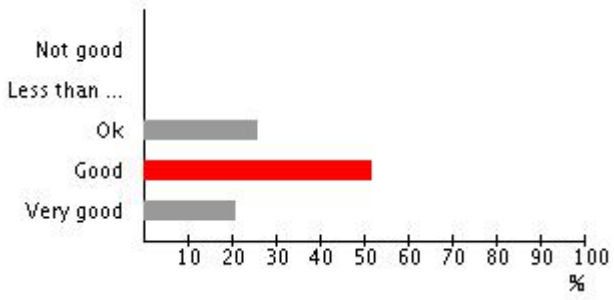
8	42,1%	Ok
7	36,8%	Simple
1	5,3%	Very simple

19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- It was difficult because I was not prepared well.
- Good level.

What is your overall impression about the labs?



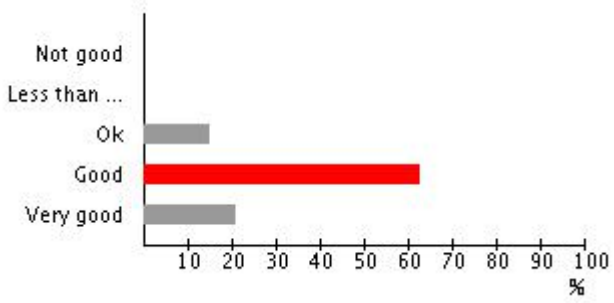
number	distribution	answer choice
0	0%	Not good
0	0%	Less than good
5	26,3%	Ok
10	52,6%	Good
4	21,1%	Very good

19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- The labs were time taking.
- A bit too much to do.
- The two labs are very good, even though it's a little difficult
- The second one has too much the same as the first one
- Dom tog lång tid att debugga och tweaka parametrar. Efter att Omid tillhandahöll testfall blev debuggingen lättare.

How did you like lab1 (EKF)?



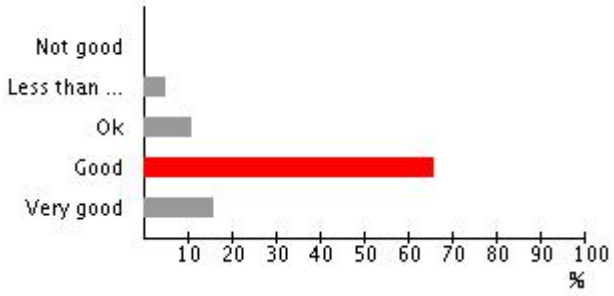
number	distribution	answer choice
0	0%	Not good
0	0%	Less than good
3	15,8%	Ok
12	63,2%	Good
4	21,1%	Very good

19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- Instead of understanding the algorithm and implementation, we spent most time in guessing a proper set of parameters.
- There were come doubt in the lab instruction but the TA made them clear.

How did you like lab2 (PF)?



number	distribution	answer choice
0	0%	Not good
1	5,6%	Less than good
2	11,1%	Ok
12	66,7%	Good
3	16,7%	Very good

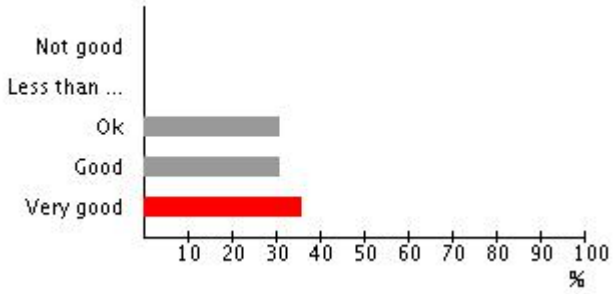
18 has answered of 39 (46%)
Maximum number of choices: 1

Comment:

- It is helpful for me to understand PF. I like that this lab task is tightly connected to the previous lab1. However, it

seems my laptop is not powerful enough to deal with this problem well.
- I have some difficulty interpreting the final results

What do you think about the help Omid gave you with the labs?



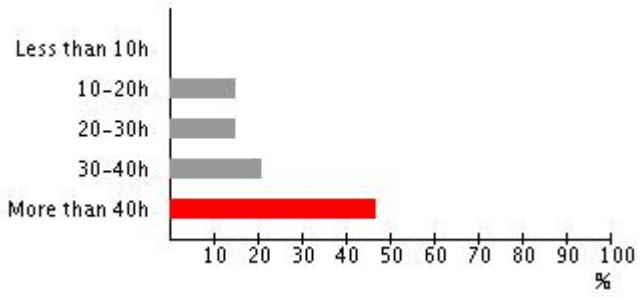
number	distribution	answer choice
0	0%	Not good
0	0%	Less than good
6	31,6%	Ok
6	31,6%	Good
7	36,8%	Very good

19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- Not responding emails.
- Omid is very kind and helpful.
- I hadn't attend any help sessions. His test functions were very helpful to test my codes.
- Although it would have been nice if the algorithms had been given (introduced and clarified in a theory lab session.eg the association and likelihood.

How much time did you spend on the two labs?



number	distribution	answer choice
0	0%	Less than 10h
3	15,8%	10-20h
3	15,8%	20-30h
4	21,1%	30-40h

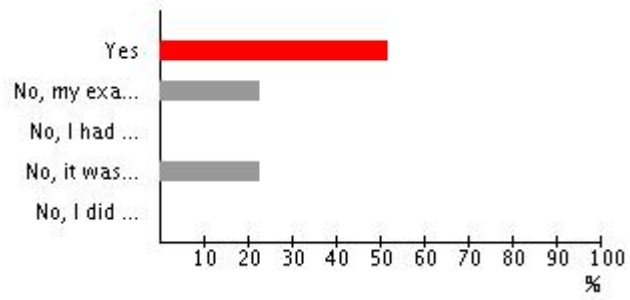
9	47,4%	More than 40h

19 has answered of 39 (48%)
Maximum number of choices: 1

Comment:

- If the parameters of lab1 can be obtained more efficiently,and the lab2 can be run faster on my laptop, the time would be reduced a lot.
- Too much time.
- Not easy to say how many hours. I think it would be great if the TA can explain the main principle and the expected result of each lab, since we spend lots of time to read and understand the priciple and requirement of each lab.
- The second lab was shorter than the second one if you have understood what you have done.

Did you complete a project assignment?



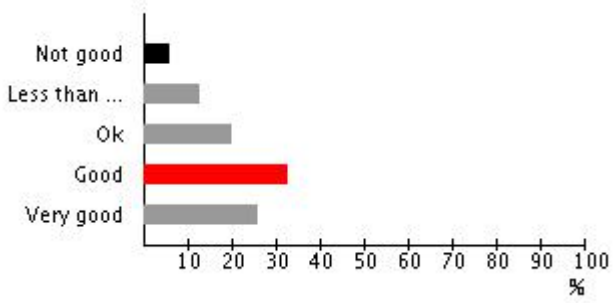
number	distribution	answer choice
9	52,9%	Yes
4	23,5%	No, my exam grade was not good enough to benefit from it
0	0%	No, I had learned all I needed already
4	23,5%	No, it was not worth the time
0	0%	No, I did not have to so why do it

17 has answered of 39 (43%)
Maximum number of choices: 1

Comment:

- Since a wrote an A on the exam it was my impression that I would get a good grade anyway. I thought that the project was only for getting an A. I am dissapointed on just getting a D.
- In the meaning that I had too much other important things to do.
- At the begining, the deadline was too close and I had no time to do it. If I had known that we had so much time, I think I would have try to do something.
- kind of put off by my exam result + personal reason

What is your overall impression about the project assignment?



number	distribution	answer choice
1	6,7%	Not good
2	13,3%	Less than good
3	20%	Ok
5	33,3%	Good
4	26,7%	Very good

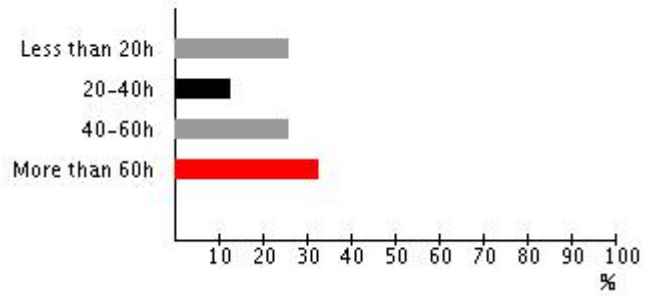
15 has answered of 39 (38%)
Maximum number of choices: 1

Comment:

- It is hard to find a proper dataset for some tasks. It is the reason I give up some more interesting problems and choose EKF SLAM.
- I do not understand why alomost no help for this part, and this is the most difficult one.
- One TA may take part in the discussion and evaluation of the project for more interaction.
- I found the project very beneficial in that it gives the opportunity to handle a complete project and learn about the details of the course materials.
- I didn't do it, but the project topics are good practical areas of estimation

---

How much time did you spend on the project?



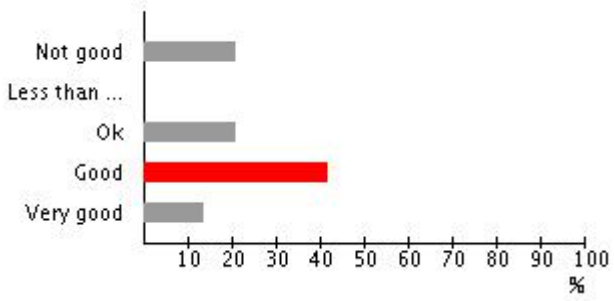
number	distribution	answer choice
4	26,7%	Less than 20h
2	13,3%	20-40h
4	26,7%	40-60h
5	33,3%	More than 60h

15 has answered of 39 (38%)
Maximum number of choices: 1

Comment:

- time-consuming
- I started the project but didn't finish it.
- I spent a lot first searching about the subject, Also the implementation took a remarkable time.

What did you think about the gust lecture by Gert Kootstra on the connection between genetic algorithms and particle filtering?



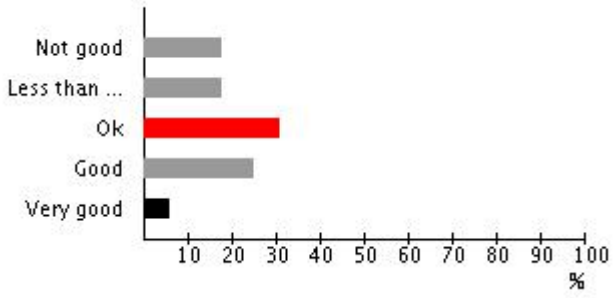
number	distribution	answer choice
3	21,4%	Not good
0	0%	Less than good
3	21,4%	Ok
6	42,9%	Good
2	14,3%	Very good

14 has answered of 39 (35%)
Maximum number of choices: 1

Comment:

- Did not participate.
- Missed it

What did you think about the guest lecture by Adrian Bishop about multi target tracking, data association and the PHD filter.



number	distribution	answer choice
3	18,8%	Not good
3	18,8%	Less than good

5	31,3%	Ok
4	25%	Good
1	6,3%	Very good

16 has answered of 39 (41%)
Maximum number of choices: 1

Comment:

- Not attended.
- I have to say that the lecture is not so clear to understand.
- This lecture was very interesting.
- Most of the information he gave were too difficult to understand but he was very motivated and it was great to meet somebody who apply these algorithm for his job.

Things that were good with the course that we should stick to

10 has answered of 39 (25%)

Comment:

- The way of teaching was good.
- To focus on the KF and the PF. Perhaphs good have less theoretical background to be able to learn more about implementing the filters.
- the labs are good,and the help from the TA is ok.
- Labs are good and the exam is really necessary.
- With all my respect, I have to admit that if I were you, I would definitely teach this course in a different way. I cannot describe my method here, but if I find some free time, I am going to create some lecture notes and give them to students of the next year to understand what is going on in this course with this hope that they would find it easier to follow the course.
- practical projects (specially related to robotics) that were presented occasionally by the professor in between the lectures.
- Föreläsningarna var väldigt bra
- - The course lectures - General concept of the labs - Experimental examples and simulations in the course - Implementing the algorithms in the class (like as you did for the Kalman filter in the class)
- The way the lectures are given and the guest lecturers ,the style of the exam.
- the two lab are very good for my learning

Things with the course that could be improved?

10 has answered of 39 (25%)

Comment:

- Longer lab sessions and more number of lab assistance.
- The course would be more interesting if there are diverse application examples of algorithms, although I know they are hard to find.
- I did very good on the exam and I thought that that was supposed to give me a good grade on the course. I thought that the project was only for getting an A. I am dissapointed on my D. I think the exam should be worth more. The project had a deadline some time after that the course was finished and I think that everythink related to one course should be done in the regular time, that is, during six-seven weeks.
- More detailed explanation about the practical application, which can make the labs easier. There should be help for the project.
- Use more lecture slides and it's more efficient for displaying.
- It is all about different method of teaching I just answered in the previous question.
- Labbarna var väldigt tidskrävande. De var inte svåra teoretiskt sätt, men rent praktiskt tog det lång tid innnan allt fungerade som tänkt. Debugging och tweakning av parametrar tog upp den mesta tiden.
- - The labs' instruction - The guest lectures

- Grading i.e. May be make the project mandatory
- to give some help on the project assignment.