Re: Jacob Clouse - Lego Final Project 551

Kevin Knuth <kknuth@albany.edu>
Mon 11/20/2023 4:04 PM
To:Clouse, Jacob P <jclouse@albany.edu>

3 attachments (7 MB)
knuth+erner+frasso-me07-final.pdf; malakar-gladkov-knuth---481054-pub.pdf; robot code.zip;

Hello Jacob

I was going over the old code (some of it is 15 years old... fortunately it doesn't get dusty),
and I was trying to remember how it all fits together.

Let me try to get you started.
I do not recall which research papers I sent you.
So I am attaching a couple of key papers.

The problem is that we have a robot with a light sensor and it is situated in a black field on which is placed a large white circle.
The robot's task is to find the circle by estimating the center position of the circle as well as its radius.
This is a Bayesian inference problem solved using the Nested Sampling Algorithm (from the current HW set) with light sensor data that it has collected.
The forward model to predict what the sensor should see is more complicated than just light/dark. It uses the spatial sensitivity of the light sensor to predict a graded response.
This is discussed in the paper by my former student Nabin Malakar.

The second component to the code is to compute an entropy map to decide where to measure next.
The nested sampling algorithm, used above to estimate the circle parameters, allows you to generate samples from the posterior.
These are all probable circles.
The code uses about 50 of them to generate 50 predictions of what the light sensor would measure at every point on the map.
The set of predictions has a distribution, and the ones with the maximum entropy is the best place to measure next.

It is the location that promises the greatest amount of information.

The main file in the code is shapes.m
It is basically the main file of the Nested Sampling algorithm.
You will see the other files, like apply.m, in there as well.
shapes.m is the main code that you will be playing with.

I controlled the LEGO brick by communicating with it (parameter and measurement result passing) via files.
And then I had programs in the native LEGO NXT code to home the robot, move the robot, and take a measurement.
You can replace that code with your own code to perform the same tasks.
When you get the robot, you will see that there are LEGO touch sensors uses to make sure that the robot does not exceed limits.
I use them for homing the robot as well.

I hope that this is helpful.
I realize that in many respects this is a heavy lift, so please do not hesitate to ask me questions.
I am happy to help, and grateful to get this project functional again!

Thank you!
Kevin

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On Sun, Nov 19, 2023 at 6:29 PM Kevin Knuth <kknuth@albany.edu> wrote:

> Hello Jacob
>
> This is great news!
> I will be able to send you code tomorrow. And I will plan to bring in the robot on Tuesday.
>
> Cheers

Kevin

On Sat, Nov 18, 2023 at 5:07 PM Clouse, Jacob P <jclouse@albany.edu> wrote:

> Hello Professor,
>
> I got all the software setup on my system for the Lego EV3 unit and read a bit of the documentation.
>
> I know we had talked about this and said to reach out when I got to this point. Let me know what specific goals and programs you want created and I will get started on them asap.
>
> Thank you!
>
> Sincerely,
> Jacob Clouse
>
> Sent from my Verizon, Samsung Galaxy smartphone
> Get Outlook for Android