# Lab 6

EECS4312

October 21, 2015

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Objectives

To Do

Submit

Car Interlock
Controller

## Learning Outcomes

- In the Car Interlock Problem (see appendix to these slides) you describe the requirements as a complete and disjoint function table and validate the requirements with invariants and use cases. This is also the first complete requirements document that you write and submit (atomic requirements, list of monitored/controlled variables, function table specification and validation of the function table). It's a small example.
- In the Hysteresis Problem you convert structured text descriptions of PLCs to function tables and validate them in PVS (see slides09.pdf).

You must specify and prove four theories as shown in the `top.pvs` file below:

```
% Exercises for Lab6
% proveit --importchain --clean top.pvs
top : THEORY
BEGIN
   IMPORTING car_interlock   %% allow only one car to pass
   IMPORTING Time
   IMPORTING Hysteresis      %% Simple Programming logic Controller
END top
```

### Preparation

Review slides09.pdf for PLCs.

# Result of running proveit on top.pvs

- See `top.summary.txt` in the `4312-lab6` directory supplied with Lab6.
- The `4312-lab6` directory also has the `Time.pvs` theories (for T-ASAMs)

- Remove all files from your `4312-lab6` directory other than **\*.pvs** and **\*.prf**. files and `car-interlock.pdf` (see appendix for further details)
- Run the following command in the directory:
- `proveit --importchain --clean top.pvs`
  (see previous slide for summary file)
- All theorems must be proven.

# Submit your work 2

- Now submit your `4312-lab6` directory:
  ```
  > submit 4312 lab6 4312-lab6
  ```
- You will get confirmation of your submission.
- Ensure that you follow the instructions (and naming conventions) carefully and precisely to ensure that your submission can be checked.
- You must also print out your requirements document `car-interlock.pdf` and submit a printed copy in the course drop box. Place your name and Prism login on the document. The document must be professionally prepared.
- To obtain a grade on your quiz, you must complete and submit this Lab according to the instructions.

# The Car Interlock Problem

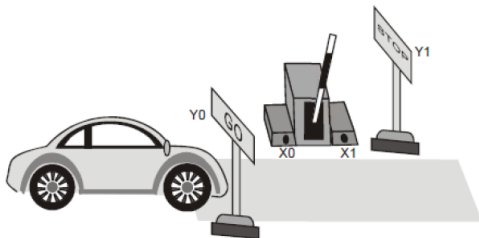**Control Purpose:**

- The Entry/Exit of the parking lot is a single lane passage. By controlling the indicators, the program ensures that only one car can pass through the Entry/Exit so as to prevent car accident between entering and leaving cars

**Devices:**

| Device | Function |
|--------|----------|
| X0 | Car entering sensor. When a car passes through the sensor, X0 = ON. |
| X1 | Car leaving sensor. When a car passes through the sensor, X1 = ON. |
| Y0 | Entering car indicator（ON means "GO", OFF means "STOP"） |
| Y1 | Leaving car indicator（ON means "GO", OFF means "STOP"） |

For the car interlock system described (informally) on the previous slide:

- Where is the System Boundary?
- What are the monitored variables? What are their types?
- What are the controlled variables? What are their types?
- Specify a complete and disjoint function table that describes the input/output behaviour of the SUD?

# Writing a Requirements Document for the Car Interlock

- Now (a) write out the atomic R-descriptions for the plant (number them) (b) state what the monitored variables are and in a different table what the controlled variables are and (c) draw the function table for the car interlock system and provide evidence that you have validated the function table.

- Submit your document as `car-interlock.pdf`.

- We will be using Latex to prepare documentation for the assignment and project. You may try to prepare the document using Latex. See `https://wiki.eecs.yorku.ca/project/sel-students/p:tutorials:latex:` (login). There is a link to a Latex table generator.

- You are not required to use Latex for this Lab. Use any documentation preparation system you like provided it is neat.

# Writing a Requirements Document for the Car Interlock

### Function Table

Ensure that it is neat! Ensure that it is minimal! It does not require more than half a page in a large font. Too many cooks spoil the broth (i.e. too many rows and not enough organization and thought spoil the function table).