Lab 1

EECS4312

September 6, 2015

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Preparation before the Lab

- Review predicate logic, e.g. from your MATH1090 notes and the resources at the PVS wiki.
- Ensure that you know the proof rules for quantifier introduction and elimination
- Read the notes in PVS-Predicate-Slides.pdf (in the Lab1 directory) for how to prove predicate logic in PVS
- Study majority-vote.pdf for how to specify and validate a majority voting circuit.

Predicate Logic in PVS

- Open the file pred_basic.pvs (in Lab1) with PVS and prove all the lemmas.
- Use split, flatten, inst, and skolem (or skeep), and their variants, as appropriate. Do not use the *grind* proof rule.
- Note that most of the lemmas can be discharged automatically with *grind*. However, doing grind will defeat the purpose

Majority Vote Circuit

- Study majority-vote.pdf (in the Lab1 directory) for how to specify and validate a majority voting circuit.
- Start a new file in PVS called majority_vote.pvs, and enter the relevant specifications.
- Use split, flatten, inst, and skolem (or skeep), and their variants, as appropriate to prove the conjectures. Do not use the *grind* proof rule.

Submit your work 1

```
% Exercises for Lab1
% proveit --importchain --clean top.pvs
top : THEORY
BEGIN
 IMPORTING pred_basic
 IMPORTING majority_vote
END top
```

- Create a PVS file top.pvs

Submit your work 2

- Create a directory `4312-lab1`
- In the directory `4312-lab1` you should see:

```
majority_vote.prf
majority_vote.pvs
pred_basic.prf
pred_basic.pvs
top.pvs
top.summary
```

Submit your work 3

- In directory `4312-lab1` run the following command:
- `proveit --importchain --clean top.pvs`
- You should now see in `top.summary`:

```
Proof summary for theory pred_basic
    quant_0...............................proved - complete    [shostak](0.03 s)
    quant_1...............................proved - complete    [shostak](0.01 s)
    quant_2...............................proved - complete    [shostak](0.00 s)
    quant_3...............................proved - complete    [shostak](0.01 s)
    quant_4...............................proved - complete    [shostak](0.01 s)
    quant_5...............................proved - complete    [shostak](0.01 s)
    quant_6...............................proved - complete    [shostak](0.03 s)
    quant_7...............................proved - complete    [shostak](0.03 s)
    distrib...............................proved - complete    [shostak](0.03 s)
    Theory totals: 9 formulas, 9 attempted, 9 succeeded (0.18 s)

Proof summary for theory majority_vote
    sanity_check_1........................proved - complete    [shostak](0.01 s)
    implementation_correctness............proved - complete    [shostak](0.20 s)
    Theory totals: 2 formulas, 2 attempted, 2 succeeded (0.21 s)

Grand Totals: 11 proofs, 11 attempted, 11 succeeded (0.39 s)
```

Submit your work 4

- Now submit your `4312-lab1` directory:
- `submit 4312 lab1 4312-lab1`
- You will get confirmation of your submission.
- To obtain a grade for your quiz, all the proofs must be discharged as shown on the previous slid.