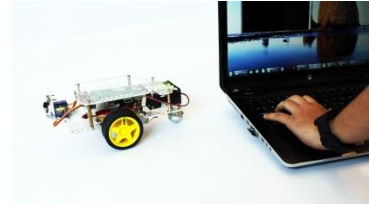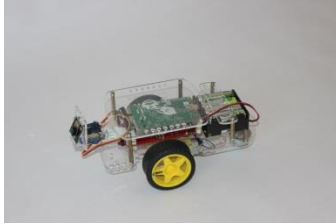# ISAT 252 - Analytical Methods IV

Python Project – Robotics

Due Date: April 29, 2015

Objective:
- To gain experience using Python for simple **robotic** programming.
- To create tasks for a robot to perform
- To write a complete OOP with a GUI

Deliverables: (Teams of Two)
1. Your modified Code on the FTP site

2. Your **videos** that demonstrate that your team was successful in modifying and running code on the GoPiGo Robot (*please submit using an online storage such asYouTube, Google doc, etc*).

3. You are required to submit a short report that has answers to the questions (on Canvas)

4. Any references (online or book) that needs to be cited.

5. Explanation what you understand from this project in your lab report.

6. Answers to the attached worksheet (on canvas)
   .

Robotics

Learning Objectives:

There are a number of objectives to this assignment. The first is to make sure you have some experience actually doing a simple **robotic** programming. Second, it will help you tune up your programming skills and prepare you for future project in other course(s). Third, because you can use the Internet to look for examples, this assignment will help you see just how many programming aids are available via the web. *This assignment is to be completed using Python!*

As with all programming assignments, your team work should be your own, and your program should be documented well enough that the grader can understand how you designed your program. **No sharing of code is allowed with other TEAMS!**

Equipment:
We will grant you access to the robotic lab in the 2nd floor in the HHS building (HHS 2002). Also, we will provide you laptops and with required password for the robots.

Exercises:
The goal of this assignment is to **develop and test** your ability to program a robot. In the lab you will use the GoPiGp robot as shown below in figure 1.
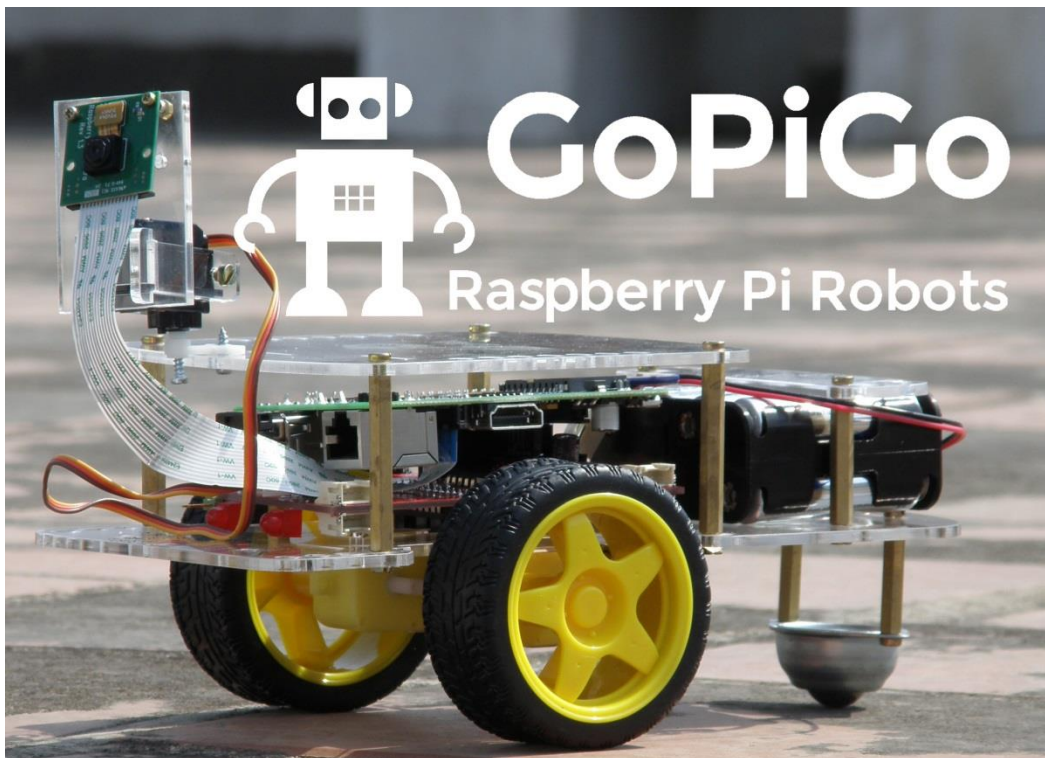

Figure1: show a GoPiGp robot[1]

Steps to Get Started:
Here are the steps (you will need) for running the robotics code in HHS 2002 (Robotics lab):

1. Use the laptops assigned to you for this project and one of the GoPiGo robots. One you select a robot; use it for the entirety of the project.

2. Make sure that your laptop connects to the internet are **connected** to the internet. (this should not be a problem since we configured them for connectivity earlier!)

3. We will be using PuTTY to connect to the robot (PuTTY is an SSH and telnet client, developed originally by Simon Tatham for the Windows platform)**.** Go to the PuTTy website and download and install PuTTy for windows. The address is:
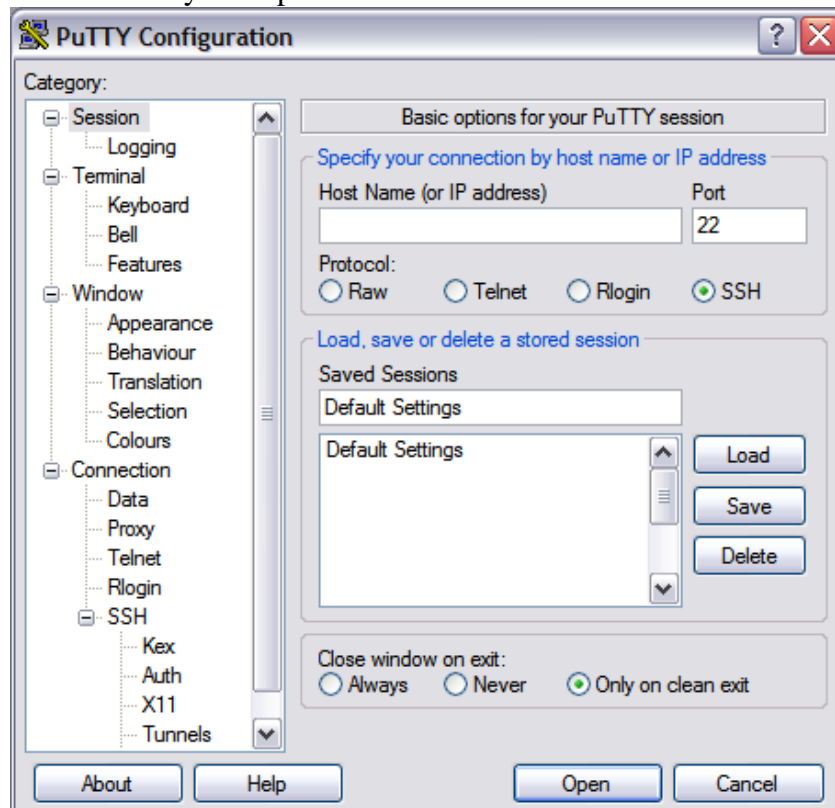
> http://www.putty.org

 I downloaded the version below from the site. It works fine and you should use this version)

> **A Windows installer for everything except PuTTYtel**
> Installer: putty-0.64-installer.exe

4. Turn on the robot.

5. Start PuTTy and open a client terminal.

6. PuTTy needs to be configured so you can connect to the Raspberrry Pi which allows the Python Program you are going to write to control the GoPiGo robot. You do this by
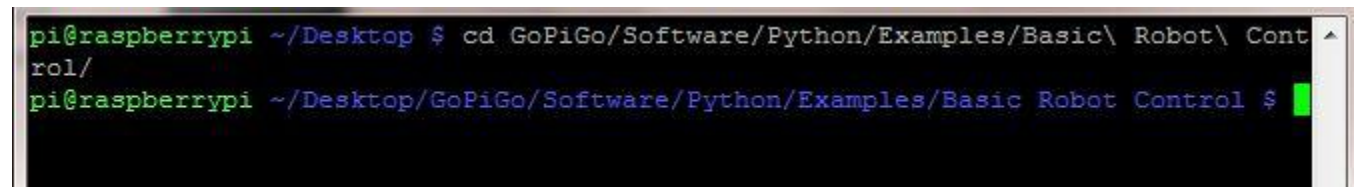
      i)\ entering in the Host name (IP address that is marked on the robot)
      ii) make sure you are using SSH protocol by clicking the radio button
      iii) give your session a name such as GoPiGo1_usernames
      iv) click the "open" button

If the GoPiGo is properly set up, this will connect to the GoPiGo via SSH and open a terminal.

Basic example:

1. Go to the Basic Robot Control folder:

```
cd GoPiGo/Software/Python/Examples/Basic\ Robot\ Control/
```


2. Start the basic_robot_control.py example

```
sudo python basic_robot.py
```

```
pi@raspberrypi ~/Desktop/GoPiGo/Software/Python/Examples/Basic Robot Control
 $ sudo python basic_robot.py
This is a basic example for the GoPiGo Robot control
Press:
        w: Move GoPiGo Robot forward
        a: Turn GoPiGo Robot left
        d: Turn GoPiGo Robot right
        s: Move GoPiGo Robot backward
        t: Increase speed
        g: Decrease speed
        x: Stop GoPiGo Robot
        z: Exit

Enter the Command: w
Enter the Command: a
Enter the Command: s
Enter the Command: d
Enter the Command: x
Enter the Command: z
Exiting
pi@raspberrypi ~/Desktop/GoPiGo/Software/Python/Examples/Basic Robot Control
 $
```

Controlling the GoPiGo:

Use the following keys to control the GoPiGo

- **w**: Move GoPiGo Robot forward
- **a**: Turn GoPiGo Robot left
- **d**: Turn GoPiGo Robot right
- **s**: Move GoPiGo Robot backward
- **t**: Increase speed
- **g**: Decrease speed
- **x**: Stop GoPiGo Robot
- **z**: Exit
-

Examine the code in the file **basic_robot.py.** You will modifiy and use this code in your robotics project with the GoPiGo.

I)   GoPiGo LED Blink

One of the simplest way to interact with the is to use the two LED's in the front of it .

With a very simple command, you can make the GoPiGo give signals or just do a simple blink.

1. Power on the GoPiGo
2. Use PuTTY to connect to the GoPiGo via SSH and open a terminal.
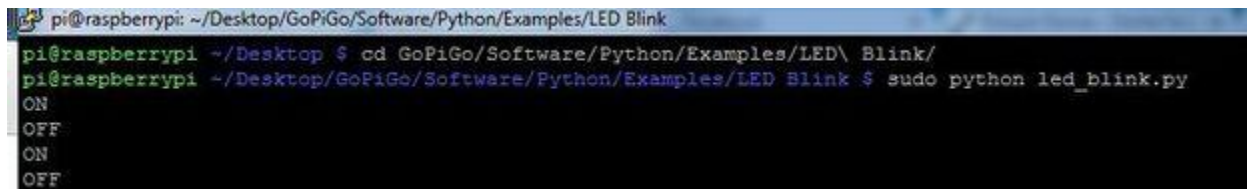3. Go to the LED example folder:

```
cd GoPiGo/Software/Python/Examples/LED\ Blink
```

4. and run the example:

```
sudo python led_blink.py
```

As soon as the code is run, you can see the LED's blinking in the Front of the GoPiGo.

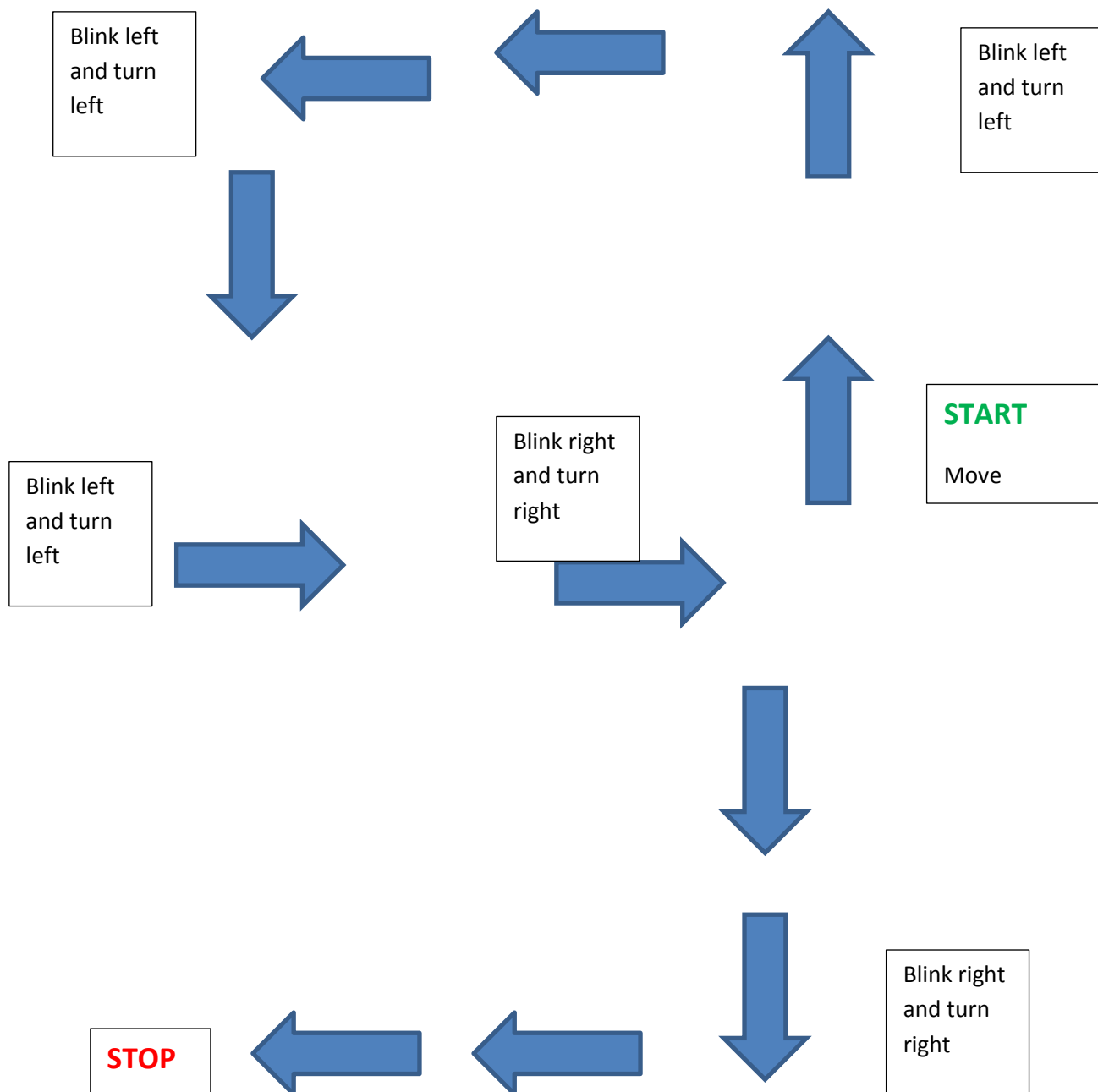You must use this code in your own robotics Projects with the GoPiGo.

The existing code demonstrates how to move, turn and blink the LEDs on the robot. You must combine these examples and write some code on your own to make the robot perform as indicated below *without using the keyboard* . That is, you must write python code tso that when the user runs the program it performs the indicated task.

TASK I:
We would like the robot to "walk" inside the room with a predetermined starting position and move along the path as indicated below (~ 4 to 5 feet in each indicated direction):

Blink left and turn left

Blink left and turn left

Blink left and turn left

START

Move

Blink right and turn right

Blink right and turn right

STOP

TASK II:

Design your own path and tasks for the robot to complete. Make sure this task involves making the robot move several times in reverse!

Grading Guidelines

The **initial** code is provided on Canvas for the groups working on this section. Below is a breakdown of points for this assignment:

- 85 pts.: Modifying and successfully running the code on the GoPiGo robot along with videos
- 15 pts: Report and answering the questions

Deliverables:

- Your modified Code!
- Your **videos** that prove of your team's success in modifying and running code on Robot (*please submit using an online storage such asYouTube, Google doc, etc*).
- You are required to submit a short report that has answers to the questions.
- Any references (online or book), need to be cited.
- Explanation what you understand from this project in your lab report.

Questions:

Coming!