Robot GUI Installation and Instruction

1   Setting up your GUI

This GUI connects to your robot and displays the readings from your robot's various sensors. In order to run the GUI, first download PySerial, Python 2.5.4, and Pygame.

2   Setup

The files needed to download are available in the Resources page of http://www.clear.rice.edu/engi128. Windows has 3 files to download. Mac has 4 files to download. Once everything is installed, Windows users will bring up the GUI by double clicking on the gui.py file. Mac users will bring up the GUI through the terminal.

2.1   Windows

1. Download Python 2.5.4. When the download completes, doubleclick and follow the instructions. Do not change the suggested folder to download Python to. Make sure it downloads to `C:\Python25`

2. Download PySerial. Run the file and follow the instructions. It should find your python files in `C:\Python25`

3. Download Pygame. Double click the .msi file and run as instructed. (Python must be installed at `C:\Python25` in order for pygame to install correctly.)

4. Set the PYTHONPATH. (Instructions also located in Setting up IDLE under the Resources tab of the Engi128 website) On Windows 7, open the start menu and type "'environment"' into the search box. Click on "'edit environment variables for your account"' which will bring up a window. Under the list of User variables, select "'New"' which will bring up another window. For Variable name, type `PYTHONPATH`. For Variable value, put the entire path location to the folder containing robot.py starting with `C:\`

5. To run the GUI, you must find the com port number your robot connects to. Go to the start menu and search *device manager*. Open device manager.

6. Plug in your robot and wait for *Ports* to show up. This may take a while if your computer needs to install driver software. When *Ports* shows up, expand the list and you should see the robot with `COM#`at the end. This is your com port.

7. The com number will change with each different robot you plug into your computer. To run the GUI, double click the gui.py file. When you run the Python GUI, the opening window will ask for you to import the serial port. Enter in your com port (ex: *com8*) If it cannot connect to the port, it will say "'Invalid com, try again"'. If you wish to run the GUI without

connecting to a robot, put 0 in the textbox. Hit enter to connect. (Do not input numbers using num pad)

2.2 Mac

1. Scroll down to Mac and install the FTDI Drivers

2. Install Python 2.5.4 for Mac.

3. Download pyserial-2.5.tar.gz. Run Archive Utility and install pyserial using Terminal. Navigate to the directory using cd and run the following command:

   ```
   $ sudo python setup.py install
   ```

   Type in your password.

4. Download Pygame. Extract and install.

5. To verify Pyserial and Pygame are installed correctly, run python (`$python`); version should be 2.5.4. Type in

   ```
    import pygame
   import pyserial
   ```

   Both should execute without errors.

6. Set up the PYTHONPATH. (Instructions also located in Setting up IDLE under the Resources tab of the Engi128 website) Open a text editor (TextEdit) and in the Format menu, select Make Plain Text. In the text editor, type the entire path location of the folder containing robot.py. Save the text file as engi128.pth in the `/Library/Python/2.5/` folder.

7. To run the PythonGUI, open Terminal. Find out what serial port the robot is by using the command

   ```
    $ ls /dev/tty.*
   ```

   One of the items should look like `/dev/tty.usbserial-A900fsPZ`
   (The last character is most likely to be different)

8. Navigate to the directory where gui.py is:

   ```
   $ cd /Users/username/filepath/PythonDisplayRONE
   ```

   and to run your python GUI program:

   ```
   $ python gui.py/dev/tty.usbserial-A900fsPZ
   ```

   The last part may vary depending on what ls /dev/tty.* returned. This method will start up the GUI connected to the robot. To run just the GUI without connecting to a robot, input

   ```
    $ python gui.py
   ```

   This will start your GUI at the serial port inquiry screen. Enter 0 to bring up the GUI without the robot.
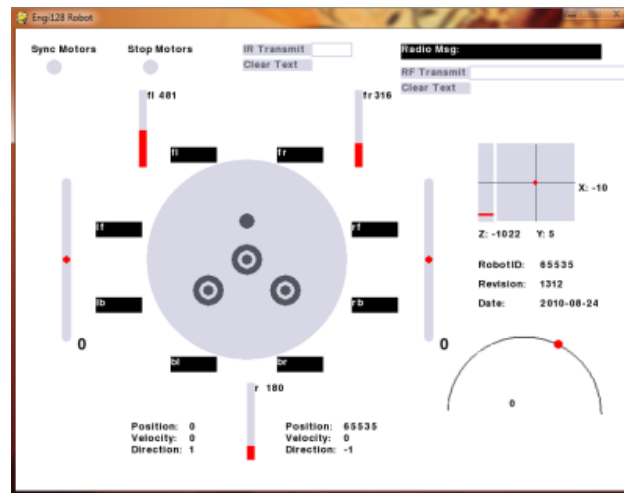
3   Interface

Figure 1: GUI at startup (com 0 input)

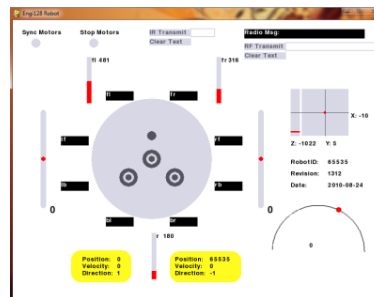## 3.1   Quadrature Encoder

Figure 2: Quadrature Encoders

The quadrature encoder is located at the bottom left and bottom right of the robot drawing. The left column corresponds to the left wheel's readings and the right column corresponds to the right wheel's readings.

3.2   Motor Control

The sliders on either side of the robot drawing control the left and right wheels. Slide the knob to the pwm at which you want to run the motors. Positive pwm will makes the robot go forward and negative pwm makes the robot go in reverse. You can *Sync Motors* and have both run at the same pwm. *Stop Motors* snaps both sliders back to 0 pwm.
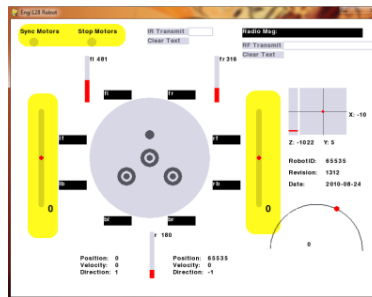
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Figure 3: Motor Control
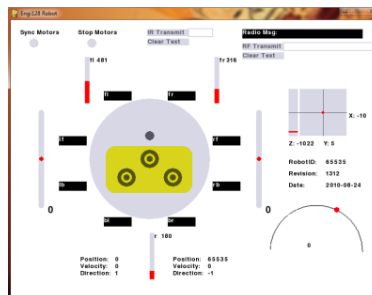
3.3 LEDs

Figure 4: RGB LEDs

The LED controls are the three rings in the middle of the robot image. When clicked, they turn on/off the red, green, and blue LEDs on the robot. The circle in the middle of the ring corresponds to the button in the LED ring on the actual robot. The GUI will display the depressed state of the button by changing the color of the center circle.
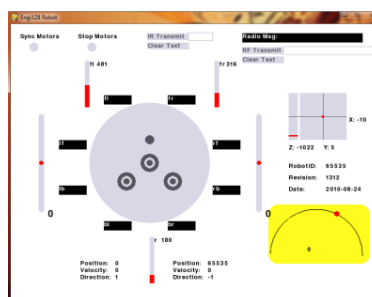
3.4 Gyro

Figure 5: Gyro

The gyro readings are shown by the arc and knob at the top of the screen. The gyro shows the orientation of the robot based on angular velocity. The knob will respond to turns made by the robot. The number displayed underneath the arc is the angular velocity.
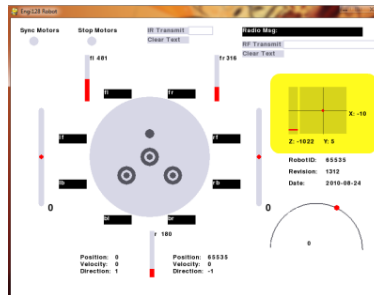
3.5 Accelerometer

Figure 6: Accelerometer

The accelerometer reading is shown on the right. The bar represents the z axis movemnt, while the coordinate plane shows the x and y axis movement.
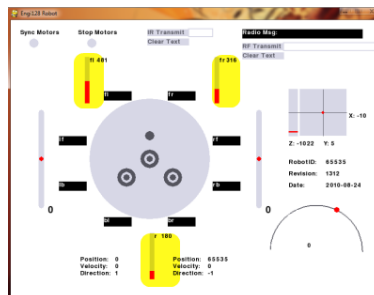
3.6 Light Sensor

Figure 7: Light Sensors

The light sensors are the fluctuating red bars on the left, right, and bottom of the robot drawing. They show the intensity of the light shined on them.

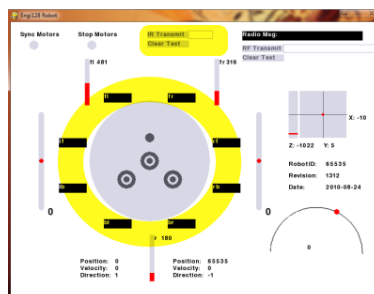### 3.7 IR Transmitters and Receivers

Figure 8: IR Transmit and Receive

There are 8 IR receivers in the ring surrounding the robot. On the GUI, they are represented by the black squares surrounding the robot drawing. When an IR receiver gets a message, it displays it on the respective receiver on the GUI. You can also transmit messages by entering a short message in the IR Tramsit text box. You must first click the box to type the message; the textbox outline will turn dark grey. To deselect the textbox, click anywhere outside it. To send the message, click the IR Transmit button. It will constantly send the message through the IR ring until you click and deselect the IR Transmit button. To clear the textbox, either select and backspace, or hit the Clear button.

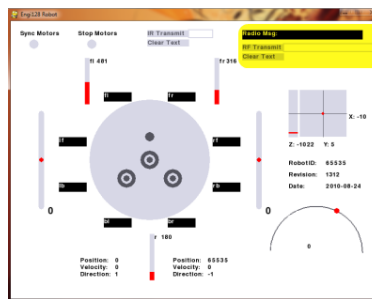## 3.8   Radio Transmitter and Receiver

Figure 9: Radio Transmit and Receive

The GUI displays the message from the radio receiver in the upper left black box. To transmit a radio message, click the textbox, then type into the Radio Transmit text box. To send the message, click RF Transmit. This will constantly transmit the message until the RF Transmit button is toggled off. To clear the text, either select the textbox and backspace, or hit the Clear button.
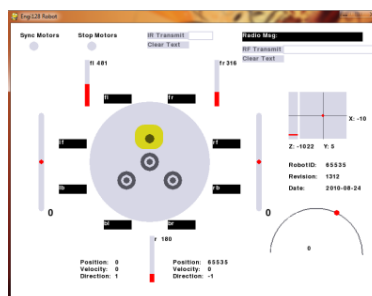
3.9   IR Beacon

Figure 10: IR Beacon

The IR beacon is located in the middle of the robot. When clicked, the LED indicator and the IR beacon will go off. They will continue to go off until the IR beacon button is toggled off on the GUI.

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4 Advance Setup

4.1 Windows

1. Go to http://www.python.org/download/releases/2.5.4/ and download python-2.5.4.msi. When the download completes, doubleclick and follow the instructions. Do not change the suggested folder to which Python downloads. Make sure it downloads to `C:\Python25`

2. Go to http://www.sourceforge.net/projects/pyserial/files/ and download PySerial. Run the file and follow the instructions. It should find your python files in `C:\Python25`

3. Go to http://www.pygame.org/download.shtml and download Pygame for Python 2.5.4. Double click the .msi file and run as instructed. (Python must be installed at `C:\Python25` in order for pygame to install correctly.)

4. To run the GUI, you must find the com port number your robot connects to. Go to the start menu and search *device manager*. Open device manager.

5. Plug in your robot and wait for *Ports* to show up. This may take a while if your computer needs to install driver software. When *Ports* shows up, expand the list and you should see the robot with `COM#` at the end. This is your com port.

6. The com number will change with each different robot you plug into your computer. When you run the Python GUI, the opening window will ask for you to input the serial port. Enter in your com port (ex: *com8*). If it cannot connect to the port, it will say "'Invalid com, try again"'. If you wish to run the GUI without connecting to a robot, put 0 in the textbox. Hit enter to connect.

4.2 Mac

1. Go to http://www.ftdichip.com/Drivers/VCP.htm, scroll down to Mac OS X and install the FTDI Drivers

2. Go to http://www.python.org/download/releases/2.5.4 and install Python 2.5.4 for Mac.

3. Go to http://pypi.python.org/pypi/pyserial and download pyserial-2.5.tar.gz. Run Archive Utility and install pyserial using Terminal. Navigate to the directory using cd and run the following command:

   ```
   $ sudo python setup.py install
   ```

   . Type in your password.

4. Go to http://www.pygame.org/download.shtml and download Pygame for Mac and Python 2.5.4. Extract and install.

5. To verify Pyserial and Pygame are installed correctly, run python (`$python`); version should be 2.5.4. Type in

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```
 import pygame
import pyserial
```

Both should execute without errors.

6. To run the PythonGUI, open Terminal. Find out what serial port the robot is by using the command

```
$ ls /dev/tty.*
```

One of the items should look like `/dev/tty.usbserial-A900fsPZ`
(The last character is most likely to be different)

7. Navigate to the directory where RobotDisplayV3.py is:

```
$ cd /Users/username/filepath/PythonDisplayRONE
```

and to run your python GUI program:

```
$ python RobotDisplayV3.py/dev/tty.usbserial-A900fsPZ
```

The last part may vary depending on what ls /dev/tty.* returned.