**ECE 578/478 Final Report**

Small Nixon

11/19/2013

Jordan Fluth, Vernon Jones

Contents

[Description 3](#__RefHeading__215_1350062729)

[Technical documentation 3](#__RefHeading__217_1350062729)

[Project Code 4](#__RefHeading__219_1350062729)

[Visual Basic Code: 4](#__RefHeading__221_1350062729)

[ROBOTC Code: 4](#__RefHeading__223_1350062729)

[Translating this Knowledge to ECE 479/579 4](#__RefHeading__225_1350062729)

[Technical or Research Problems 4](#__RefHeading__227_1350062729)

[Instructions 4](#__RefHeading__229_1350062729)

# Description

The Kinect uses the skeleton trace feature of the upper half of the body to recognize body positions and motion. These positions and movements are converted into keyboard key presses. The key presses are recognized by a visual basic script, which transmits the key presses as ASCII characters over Bluetooth to the Lego NXT brick. Using this method we achieve wireless user defined control over the robot.

Short description what was done, what was achieved. To be used by me in the combined journal/conference papers that I am writing. This part should be about 1 page and should not go too deeply to technical aspects. You will be co-authors of these papers and we will keep working on them next quarter. We published several papers with students from this class, based on their work.

# Technical documentation

1. Components and subsystems
   1. FAAST Program – Translates gestures detected by the Microsoft Kinect into key presses
   2. Personal Computer with Bluetooth capability – This is the central hub for receiving and transmitting data.
   3. Lego NXT Brick – Provided by the class. The brick runs a RobotC program that translates commands sent over a Bluetooth connection into motion.
   4. Two Hi-Technic Motor Controllers – Provided by the class. One of the controllers controls the wheel motion. The other controls shoulder and elbow motion.
   5. One Hi-Technic Servo Controller – Provided by the class. This controls the motion of the hand, wrist, and left and right rotations of the shoulder.
   6. Microsoft Xbox 360 Kinect – Provided by the class. This uses two cameras and a range finder to give the user vision with depth. It also uses a skeleton trace which is needed and used by the FAAST program.

* What technical troubles did you find in your work? How you solved them, ultimately?
* Write a complete “troubleshooting manual” for the next users of your robot. The weakness of our previous projects was that the next students were starting all-over from scratch as there was no good documentation. Now it has to be dramatically changed.
* Give your personal advice to the next students about the project work like yours. This must be directly related to your project but should be written in a more general way. How should they organize their work? Where should they find information? How should they set up meetings? Where to look for information? For Components? Useful webpages and books. What should be added to my class slides that would help in this project?

# Project Code

## Visual Basic Code:

## ROBOTC Code:

Technical documentation to software of your robot. The code must be very well documented. Comments for each subroutine, each variable, each block of code. The source code should be in separate files. BUT IT MUST BE ALSO IN THE MAIN DOCUMENT, WELL FORMATTED.

# Translating this Knowledge to ECE 479/579

How you may use knowledge that you learnt in ECE 478 in the next quarter to add more interesting perceptions and behaviors to your robot? The goal of this part is that you will show your knowledge and critical/creative understanding of class material. You will be not asked to execute what you write here, it is only a plan. This part should be especially well written by students who take it for ECE 578 credit. Add as much technical/mathematical detail as you deem useful to explain your idea in full detail.

# Technical or Research Problems

Technical or research problems that should be solved to achieve the goals set to your robot better. For instance, iSOBOT has no sensors. What kind of sensors you can propose to give feedback to the computer to create complete behaviors – for instance camera.

# Instructions

**Step by Step:**

1. Setup FAAST and Kinect and interface between the two
   1. To start download and install the Microsoft Kinect for windows SDK. It doesn't matter if you have a XBOX 360 Kinect; it will still work. [Click Here to download](http://www.microsoft.com/en-us/kinectforwindows/develop/)
   2. Download FAAST. FAAST translates movements on the Kinect into functions on a keyboard or keypad. [Click Here to download](http://projects.ict.usc.edu/mxr/faast/)
   3. Connect your Kinect to your PC and allow the drivers to install from the SDK and the Windows Database.
   4. Once the drivers have been installed, open the FAAST program that you downloaded earlier.
   5. From the Tracker drop down menu, select Microsoft so that the program will know that you are using the Kinect with the drivers you've installed.
   6. Click the connect button.
   7. Next, click Gestures. Here you can make the movements you do that are recorded by the Kinect could translate to a key, or multiple keys on a keyboard.
2. Click [here](http://www.extremenxt.com/vbpart1.htm) for instructions on setting up a Visual Basic script to communicate over Bluetooth between the computer and the Lego NXT brick.
   1. Notes: We will be modifying the Visual Vasic script so that the first textbox will be for debug purposes and the second textbox will be for operational purposes.
   2. Additional instructions not on the website:
      1. Add a second textbox and a third label.
      2. Make the third label say “Auto Send”
      3. Make the second textbox say “button click” when the textbox changes.
      4. Add code to clear the text box at the end of the function.
3. Install ROBOTC on your computer and setup the IDE for your application (connect NXT to PC through USB)
   1. Use the configuration wizard to setup servos and motors
      1. Go to menu: ROBOTPLATFORM TYPELEGO NXT + TETRIX/MATRIX
      2. Go to configuration wizard: ROBOTMOTORS AND SENSORS SETUP
         1. Click tab: \*\*\*
            1. X
         2. Click tab: \*\*\*
            1. X
         3. Click tab: \*\*\*
            1. X
4. Copy the ROBOTC:
   1. Source code: