EECS113: Processor Hardware-Software Interface
Project Proposal:
App Controlled Car

"Squad 3"
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1 Project Descriptions and Features

For this project we will build an app controlled car that will use the built in gyroscope in our phones to control the direction that the car moves. Through bluetooth we will connect the PYNQ board that will be the motor of our car and design an app to create a GUI that is user friendly to facilitate control of car. With the gyroscope we will be able to sense the movements of the user to change the direction of the car. We will also add sensors to our car that will help avoid collisions (smart braking) as well as perceive when the car is approaching an edge or about to fall off. However, the smart braking and depth perception will be an extra add-on if we accomplish our primary goals.

2 Plan/Schedule/Progress

*What is our plan and how do we want to finish this in 5 weeks?

Our ultimate goal is to have a car where we will be able to control it in various ways (turn wheels, accelerate, decelerate). We also hope to end up with a car that will have sensors on it and know when to stop, "smart braking", when it senses that there is something in its path (ranging between inches and couple feet). A possible attachment that we may add-on is depth perception, as in the car will know when it's approaching an edge and stop before it falls. However, like we mentioned earlier, this will be extra that we will include if we first finish our primary goal of just being able to control the car.

For the primary design, we want the car to be able to respond to the user phone's gyroscope "position" or "angle" and position accordingly. For example, if the user tilts their phone forward, the car will accelerate. Tilt backward and the car will brake. Tilt to the left and the wheels will turn left, tilt to the right and the wheels will turn right.

Progress-wise, we plan on doing things in this order:
1) Construct a car based off the kit we bought with inclusion of power supply from batteries in a battery box (we plan on using multiple AA baterries).
2) Program the board in a way that it will be able to control the motors of the wheels.
3) Design an app for phone so that PYNQ will recognize actions done.
4) Establish bluetooth connection between phone and board.
5) Allow phone to be able to control board which essentially controls motors, etc.

3 Timeline

*An idea of how we are going to accomplish things and in what time manner.

Week 5: Finished researching about the project and ordered the parts we needed (bluetooth PMOD, battery box, chassis kit).

Week 6 and Week 7: Receive all the parts and started assembling the car kit as well as look up drivers to see if the devices that we bought are compatible with the PYNQ board; connect the PMODs to PYNQ board as well. Start thinking about building the app for the phone as well as how bluetooth works and how it would connect to phone.

Week 8: Test the equipment, and see if the car rotors are working properly and PMODs work/connect with the board properly. Try to finish making the GUI for the application to control the car and start establishing bluetooth connection between board and phone.

Week 9: Car kit fully assembled and connected to PYNQ board. Bluetooth connection works and rotors work properly. Car will be controlled via application and . Basically have the project in a state where it is ready (or 95 percent ready) for submission.

Week 10: Final modifications if there were any bugs or last minute problems that occurred. If everything is all set, work on adding extra components or fine-tuning project. Maybe build a website for the project if there is extra time.

4 Parts and Necessities

All of the materials that we need to complete this project are:

1 PYNQ Board
1 DIYmall Car Chassis Kit
1 Battery Box
1 Pmod BT2: Bluetooth Interface
1 User Smartphone (with self-made app to control car) various building materials (cardboard, styrofoam, plastic, string, etc.)

The DIYmall car chassis kit comes with a simple attachment platform, 4 wheels, 4 mini-motors, and various screws and bolts to attach the wheels to the platform. We will attach the battery box to the car ourselves in order to power the motors. We will also attach the PYNQ board onto the platform in order to control the acceleration, braking, and direction turning of the motors. The Pmod BT2 attachment on the PYNQ board will be our primary way of communicating with the car using our smartphones. We plan to design an app that utilizes the gyroscope built into the phone to turn the phone into a remote controller for the car. The smartphone will be connected to the bluetooth attachment on the PYNQ board for communication. We may use other building materials in order to attach the PYNQ board onto the car and modify the platform sizes if certain things do not fit.

5 Tasks and Work Distribution

Since there are 3 members in our group, we will be splitting the workload among the three of us.
Our goal is to have one person develop the phone app that will deal with the gyroscope based on the phone movements.
Another person will on establishing bluetooth connection between the phone and the board and making sure that info generated from the phone can be sent to the board.
The last member will work on assembling the car together in a reasonable and efficient way that will deliver good performance as well as power up the board with the battery box and have the board connected to the motors for the wheels.

We will of course, not stick solely to our own tasks and help each other out when assistance is needed.
We ARE a squad after all.