Project Title: KobukiKart
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EECS 149 Project Charter Fall, 2017

Overview:
The goal of this project is to make mario kart race in real life using WiiMotes as controllers and Kobuki's as karts, and objects on the ground as items. The Kobuki's will respond to the WiiMotes to determine their motion and items on the ground as they would in mario kart.

Approach:
We will be experimenting with different software stacks to find the most reliable way to connect the WiiMote to the Kobuki. We will then use finite state machines to design the movement and actions taken by the Kobuki.

Objective:
This project will bring childhood dreams to real life by transforming an iconic video game into reality.

Major Deliverables:
Our major deliverables will simply be the Kobukis that are connected to the WiiMotes, and a full fledged course on which to race the Kobukis. We hope to make this as close to the real MarioKart video game as possible so we will try to incorporate weapon/boost items into the race as well. This will be a final priority however, as our primary goal is to be able to race the Kobukis controlled with WiiMotes.

Milestones:
October 17 - Project Charter
October 18 - Proper communication with Kobuki/WiiMote
November 8 - Proper movement of Kobuki with respect to inputs from WiiMote
November 29 - Recognize and respond to items
December 2 - Complete Track
December 6 - Race

Schedule:
October 11 - Logistics + What To Buy
October 17 - Project Charter
October 18 - Proper communication with Kobuki/WiiMote
October 25 - Design communication model between WiiMote and Kobuki
November 1 - Begin implementation of movement control
November 8 - Finish and test proper movement of Kobuki with respect to inputs from WiiMote
November 15 - Start designing/building track
November 22 - Thanksgiving Break
November 29 - Recognize and respond to items

December 2 - Complete Track
December 6 - Race

Constraints:
We are constrained by mapping MarioKart objects into real life (banana peels, shells, etc.), and the scalability (realistically 2-4 Kobukis racing at a time).

Risks and Feasibility:
There are many aspects of this project that can be considered risks and/or feasibility issues. For starters, the Kobuki is not particularly sensitive and since we will be driving the Kobuki using the WiiMotes over Bluetooth, we may not have very responsive robots to race. Another major unknown at this time is the software stack to interface with the Bluetooth transmitted data from the WiiMote. We will have to figure out a way for the Kobuki to respond to the the movements of the mote as priority number 1.

Critical Path:
The project is fairly linear, so the critical path is getting from start to finish with moving the Kobuki and having it react to items on the ground.

We have broken down each major milestone to divide the responsibilities of design and implementation in order to parallelize them. Design tasks will be completed by us before the scheduled implementation. With this, we can design for future deadlines while implementing current designs. For design we have allotted the first two days of the work week on any new milestone. We hope to spend the next 4 days of the work week actually writing code or physically executing the milestone target. We hope that majority of this can be done during lab sections. Finally we will use the last couple days before the next milestone starts on debugging. We hope to do most debugging concurrently with development but any final bugs that need to be hashed out will be taken care of in the last two days of the workstream week. We have allotted an extra week at the end of the last target to write reports and finalize documentation.

We have planned for unforeseen circumstances by giving ourselves a week gap during thanksgiving, and planning for our project to be ready the week before it is due. With this we have 2 weeks of buffer time in case anything goes wrong.

Work Breakdown
We find it easier/best if we all worked on the same parts at the same time. We can parallelize tasks within our weekly schedule, but would like to leave the largest schedule as is.

October 18 - Proper communication with Kobuki/WiiMote (Design: Nikhil, Implement: Rohan)

- Selecting Bluetooth interface
- Ensuring communication can be established between Kobuki and Wiimote
- Test multiple Kobuki/WiiMote pairs can be connected at the same time

November 8 - Proper movement of Kobuki with respect to inputs from WiiMote (Design: Morgan, Implement: Rohan)

- What Wii movements correspond to what Kobuki movements
- Do we need filtering?
- How should we scale speeds and turns with the WiiMote?
- Test Kobuki responds as expected to WiiMote movement

November 29 - Recognize and respond to items (Design: Rohan, Implement: Nikhil)

- What items will we be implementing?
- How will they be represented on the physical track?
- How can we recognize the item's presence? Will we use any extra hardware?
- Design a finite state machine to map different actions/items

December 2 - Complete Track (Morgan/ Rohan)

- Design a physical track that can accommodate multiple Kobukis and items

December 6 - Race (everyone)

- Test run a race on the physical track