Project 3: Autonomous Vehicles

You each will work on your own car. It will implement at least one of the autonomous features. You will create a presentation (like those done for projects 1 and 2). You will not give your presentation, but I will use it for scoring your project. On demonstration day (the Thursday of Finals week) you will give a live demonstration of your car running in its autonomous mode.   There will also be a voluntary race of the cares around the room using a Bluetooth connected joystick.

Your project must include the following:

1. All cars must be driven by a "Joystick" app on your phone. With a button press, they should then be able to follow a black line placed on the floor. The line will be ¾" wide and will be printed on printer paper.
2. A second autonomous features from the list below should also be implemented. You will be given more credit for implementing more, but it is not required. This list is not comprehensive, if you have another idea, please let me know so that I can approve it before you do your work.
   a. Crash avoidance. The car will drive via joystick or while following the line in part 1, but if a crash is likely the car will override and take action to avoid the crash.
   b. Follow a vehicle/signal device. Indicate via an LED when it is tracking the lead vehicle/signal.
   c. Travel a maze marked on the driving surface (you determine how to mark it) – travel from point A to point B.
   d. Following a pre-recorded path. The path data should be read from a SD file or the Arduino EEPROM.
3. Record the following information.
   a. Maximum acceleration experienced. Measure frontal and side acceleration. Report in units of g's.
   b. Record the maximum accelerations (x and y) in EEPROM or on an SD file.
   c. Download the accelerations from a test run. **Turn in the accelerations and a video of this test run.**
4. The project must include at least two functions in addition to the loop and setup functions.
5. You project must be well packaged and survive the demonstration.
   a. It should use a minimum of two 9V batteries – one for the motors and one for the Arduino.

Deliverables

1. A working car demonstration on Thursday of Finals week.
2. A PowerPoint package with the following information
   a. A one-page Project Goal
   b. Describe the design of the car.
   c. A detailed project description (include decomposition, pseudo code and actual code snippets as appropriate)
      - This can be multiple pages in length.
   d. A breadboard image for the project. Use TinkerCad or another breading board sketching tool and a photo editing application to add any modules not available on TinkerCAD.
   e. A conclusion that includes a list of best practices – what went well, what went poorly, and what you would do different; future expansions of the project, etc…
3. Arduino Code for the project.   Complete code as a separate file. Only critical snippets in the ppt.
4. A Peer-Support-Document.