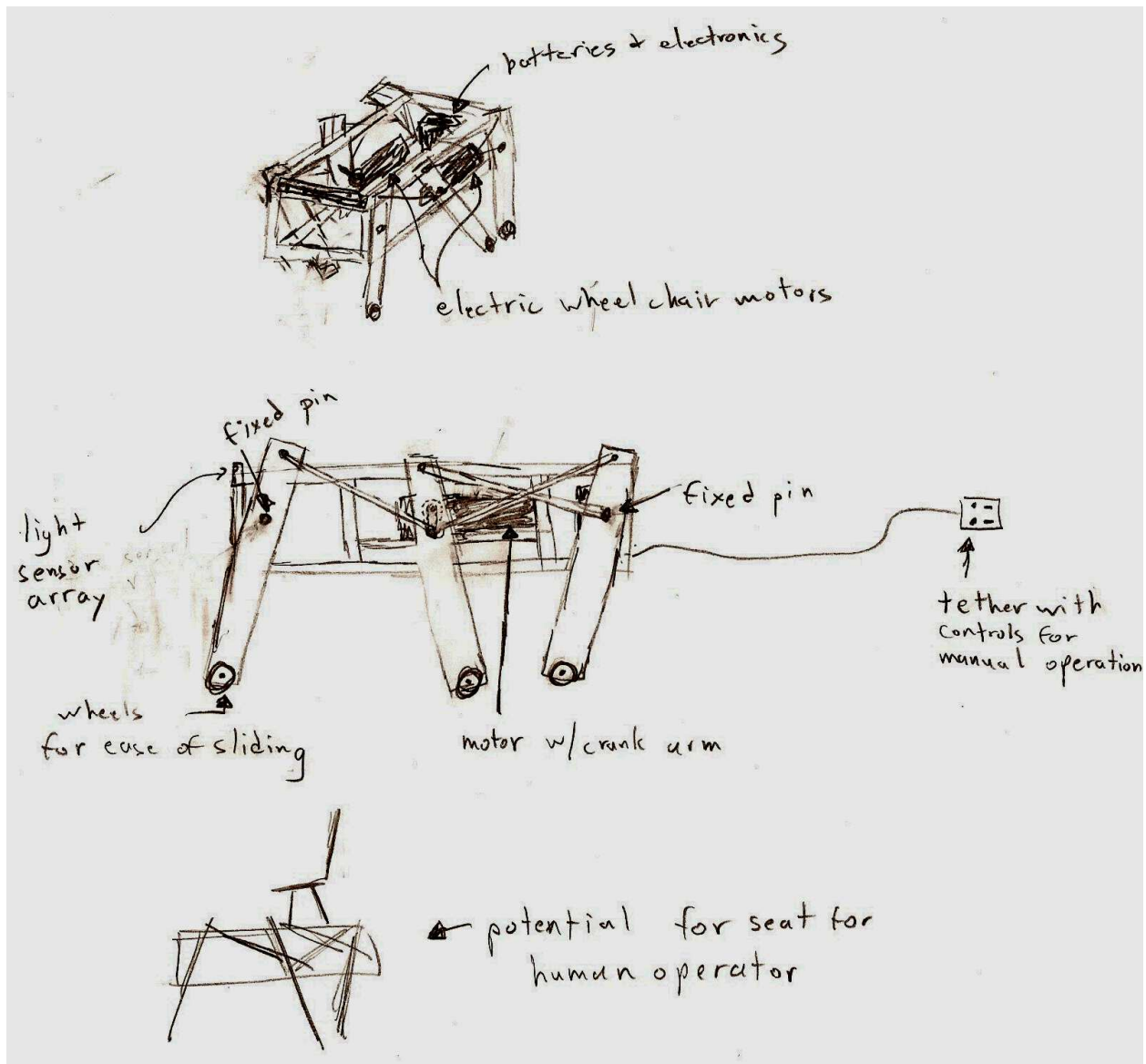


Large Scale Light Following Hexapod Robot

Abstract:

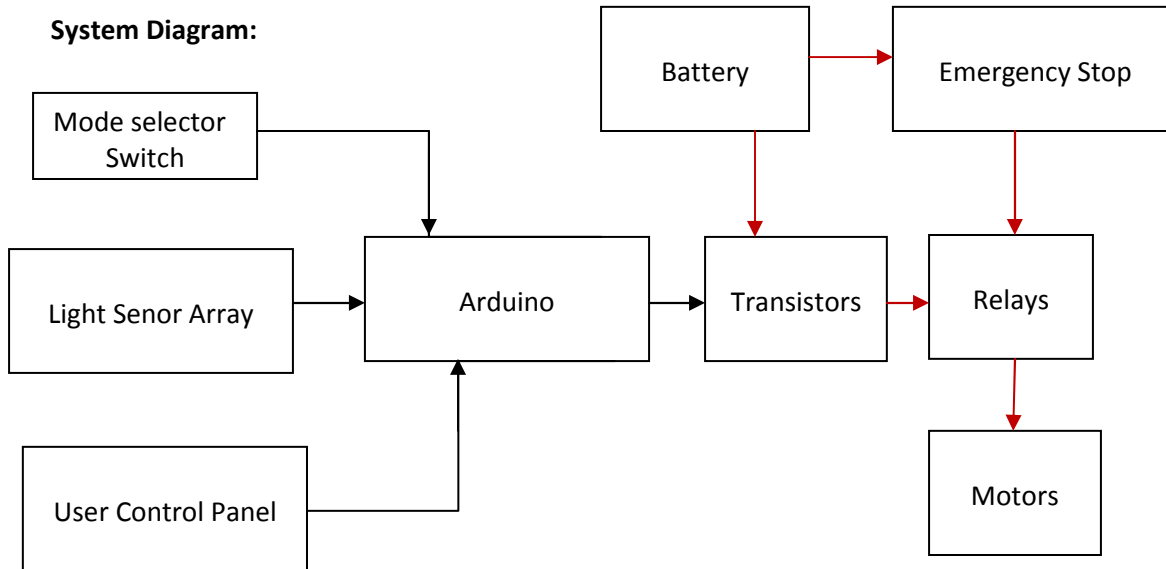
Typically, many college robotics projects are created on a small scale, less than a foot in their maximum dimension. The goal of this project is to break that paradigm, creating a robot on a much larger scale. The robot will be three to four feet in length and capable of transporting a human passenger. A hexapod drive mechanism will be used to propel the robot, and will give the robot a gait similar to that of an animal or insect. The robot will be programmed to track and follow light, and will also be capable of manual control through user input.

Sketch:

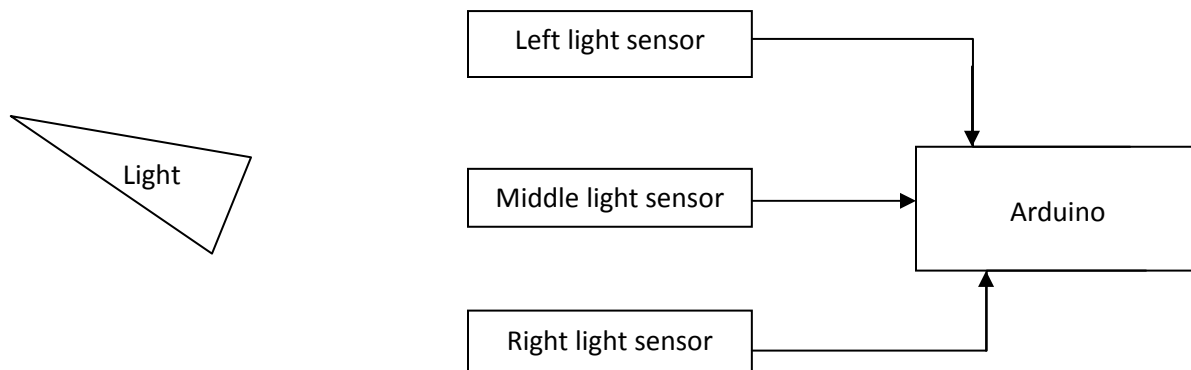


The center drawing is a depiction of one side of the robot; the other side would contain identical motor and linkage setup, a mirror image to the aforementioned drawing.

System Diagram:



A mode selector switch will send a signal to the Arduino, putting the robot in either an automatic or manual mode. In automatic mode, the Arduino will read input from the light sensors, and in manual mode, will read input from the user control panel. The code on the Arduino then processes these inputs and determines the appropriate outputs. The output sends voltages to a set of transistors, which then switch power from the battery to the relays (which require high voltage for closing that cannot be supplied by the Arduino). The relays then send power from the battery to the motors and will set the motors to forward, reverse, or off. An emergency stop switch is located between the battery and relays to serve as an immediate power cut-off to stop the robot immediately.



The program running the robot in automatic mode will be such that the robot always orients itself so the light is brightest on the middle sensor. If the light is very bright on the left or right sensor, the robot will enable a motor to turn itself so the light is shining on the middle sensor. If the light is below a certain threshold on all sensors, the robot will not move. The robot will also continuously move towards a light if it is bright enough, and will stop when it is close to the light (i.e., a certain threshold of brightness is crossed).

The manual control mode will feature two 3-way switches connected to the Arduino; each will control one motor on each side of the robot. The three positions will correspond to motor forward, reverse, and off.

Skills List:

MIG welding (currently learning in Welding class)

Wiring of relays

Programming for multiple sensor input

Parts List:

Need: Steel tubing for frame structure, legs, and linkages
Bolts for connecting legs, linkages and wheels
Steel/Aluminum plate for linkage to connect motor to center leg
Wheels for legs
Relays

Have: Batteries/capable power supply
Transistors
Light sensors (LDRs)
Motors
Switches
Wire and other assorted electronic parts (resistors, diodes, etc)

Project Timeline

- Week 1
 - Create CAD model of robot
 - Order materials
 - Prototype light sensor circuit and user input control panel
 - Write code for user input control, preliminary code for light sensor control, output serial data simulating motor control, motor control subroutines to be defined later
- Week 2
 - Construct frame and mount motors
 - Prototype transistor/relay circuit
 - Build final light sensor circuit and user input control panel
 - Finish light sensor control code
- Week 3
 - Construct and attach legs and linkages
 - Test robot mobility with simple connection of power supply to motors
 - If carrying capacity met, attach chair for human rider
 - Build relay/transistor circuit
 - Code motor control subroutines
- Week 4
 - Complete construction/modification of mechanical structure
 - Wire and install battery, relay control circuits, light sensor, Arduino
 - Test, troubleshoot user input control
 - Test, troubleshoot light sensor control
 - Rewrite/edit code as needed

Minimum condition met: Robot capable of moving forwards, backwards, and turning under user control

Maximum condition met: Robot capable of fully autonomous motion by following a light source