Ant Simulated Robot

Mechatronics Final Project Design

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Goals & Other Designs

- To build a mobile robot that is able to mimic an ant (searching for food and following a trail)
- Attempted Designs
  - Dancing robot
  - Automated Bartender
  - Fire Fighter

Real Ant Behavior

- Ants find shortest route from their nest to the source of food
- As ants travel to and from the food source pheromones are released to guide other ants
- As more ants follow the trail the pheromone trail gets stronger

Simulated Ant Behavior

- Start from an initial position (nest)
- Robot will search for "food" which will be an electronic cake (hot and bright)
- After detecting the cake thermally, the robot will simulate a pheromone trail by a marker being dropped onto the surface
- It will then travel back to it's initial position following a black (fluorescent dye) line

Floor Setting

- A single-level floor with an black (fluorescent dye) line path drawn
- The robot will follow the "pheromone trail," the line drawn on the surface
- It will simulate pheromone being released by dropping a (fluorescent dye) pen to strengthen the trail

Basic Robot Construction

- The robot will run on two modified continuous servo motors for mobilization
- A front servo motor will rotate and scan for cake f (light intensity)
- Another servo motor will simulate the pen drop
- A front bumper will detect obstacles (walls, etc)
- Power source will be supplied by 4 AA batteries which is backed up by a 3300uF x 4 capacitor bank for surge current stability
- Basic Stamp 2 consists of the main circuitry and P-Basic program
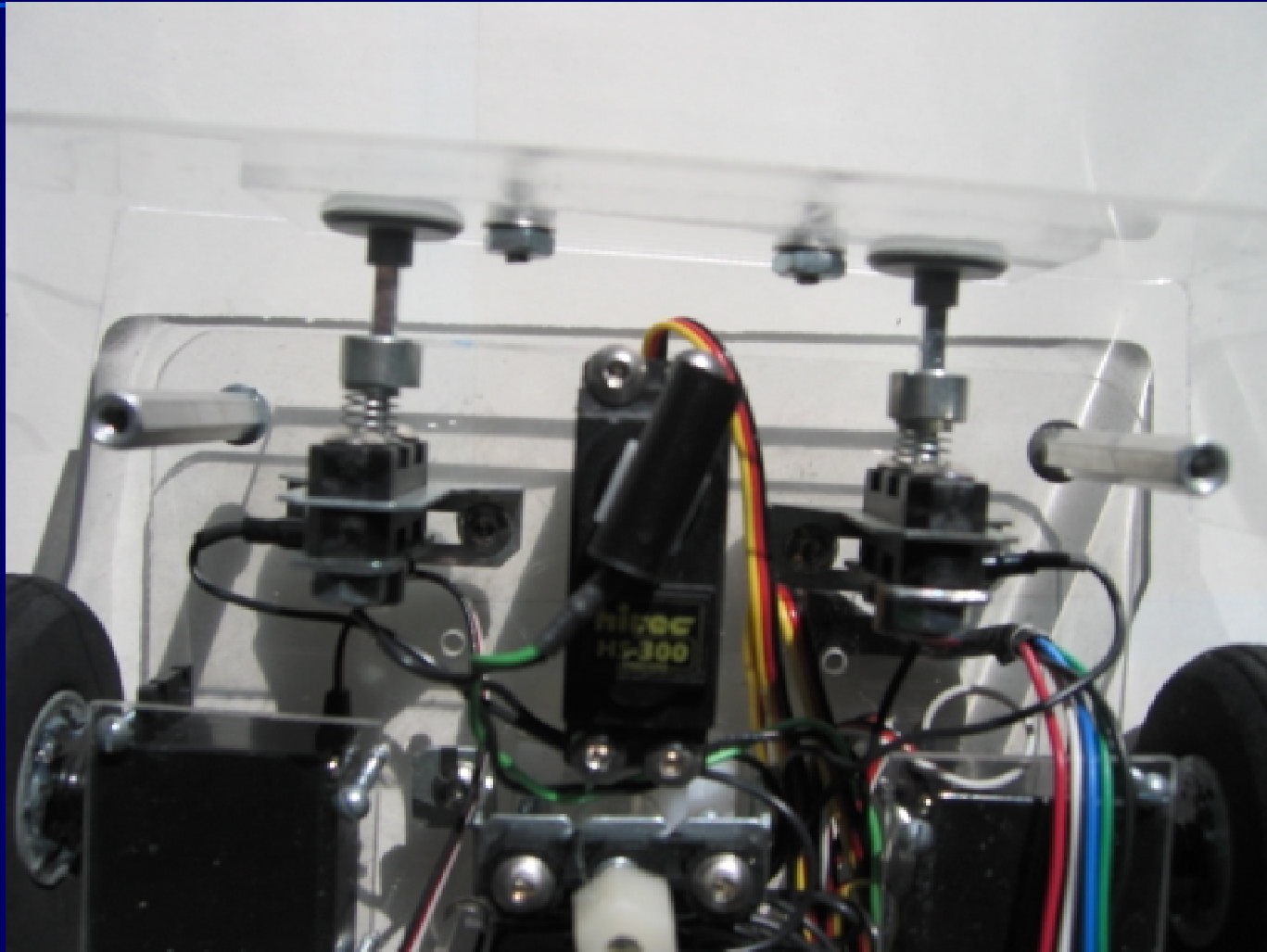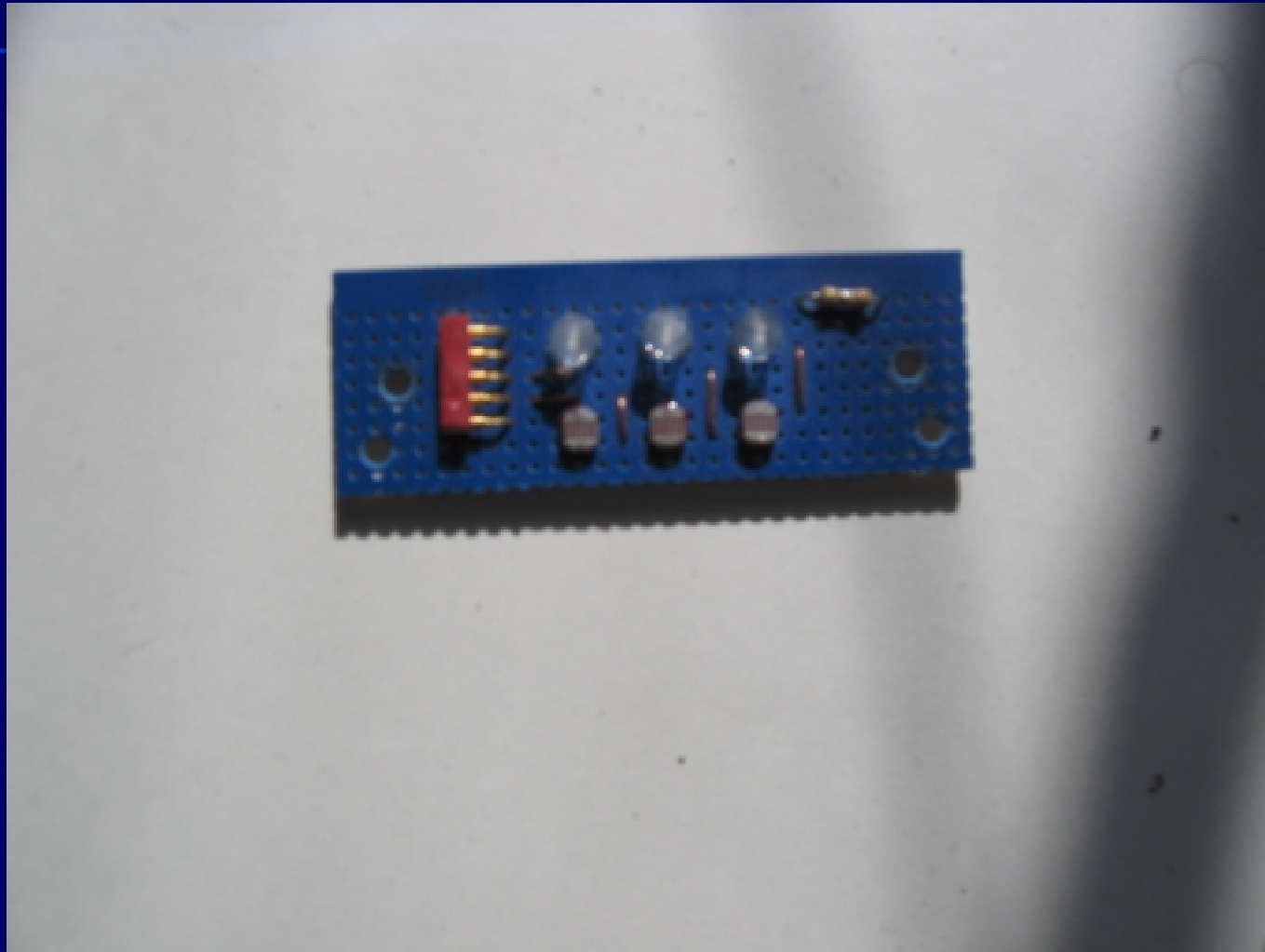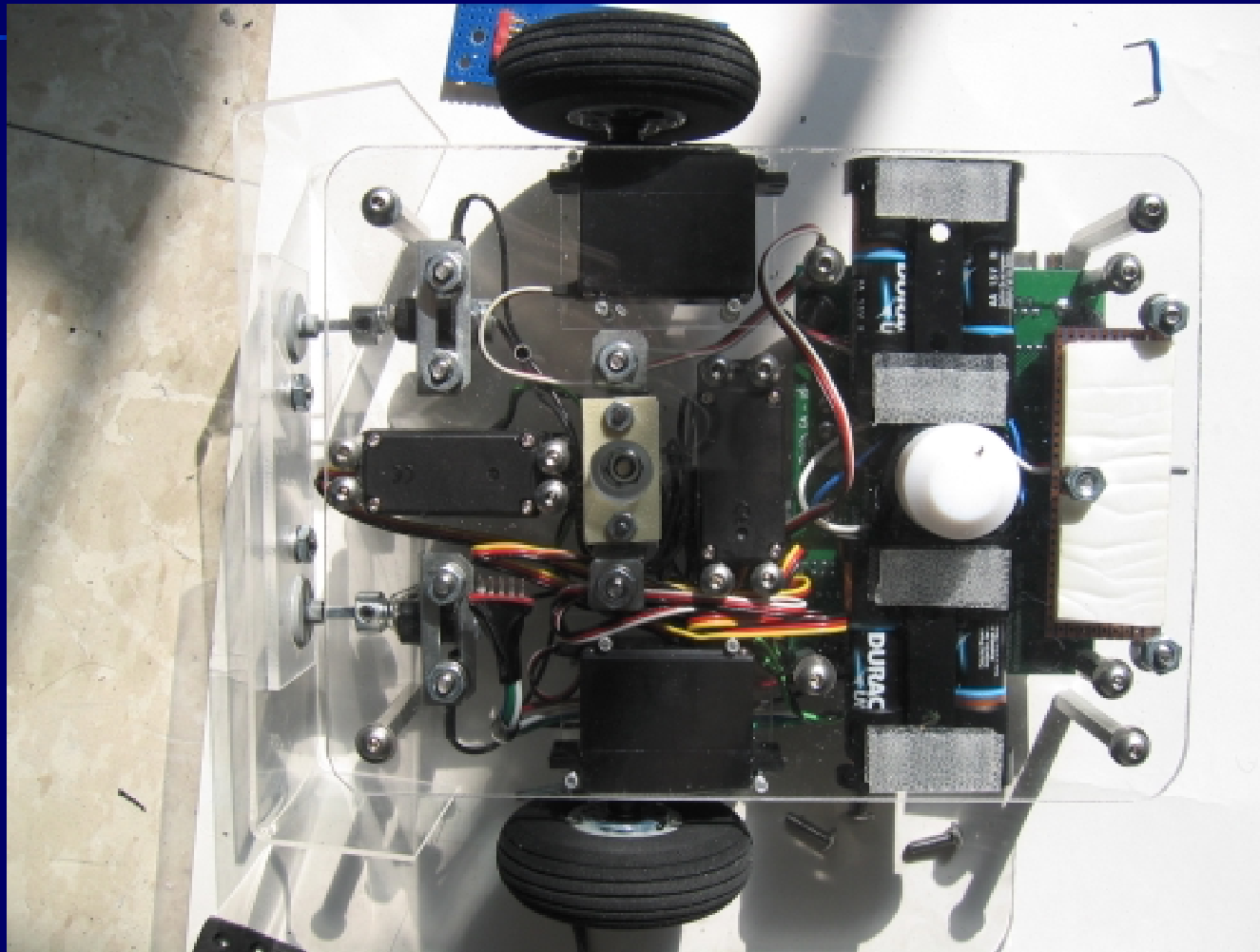
Top View
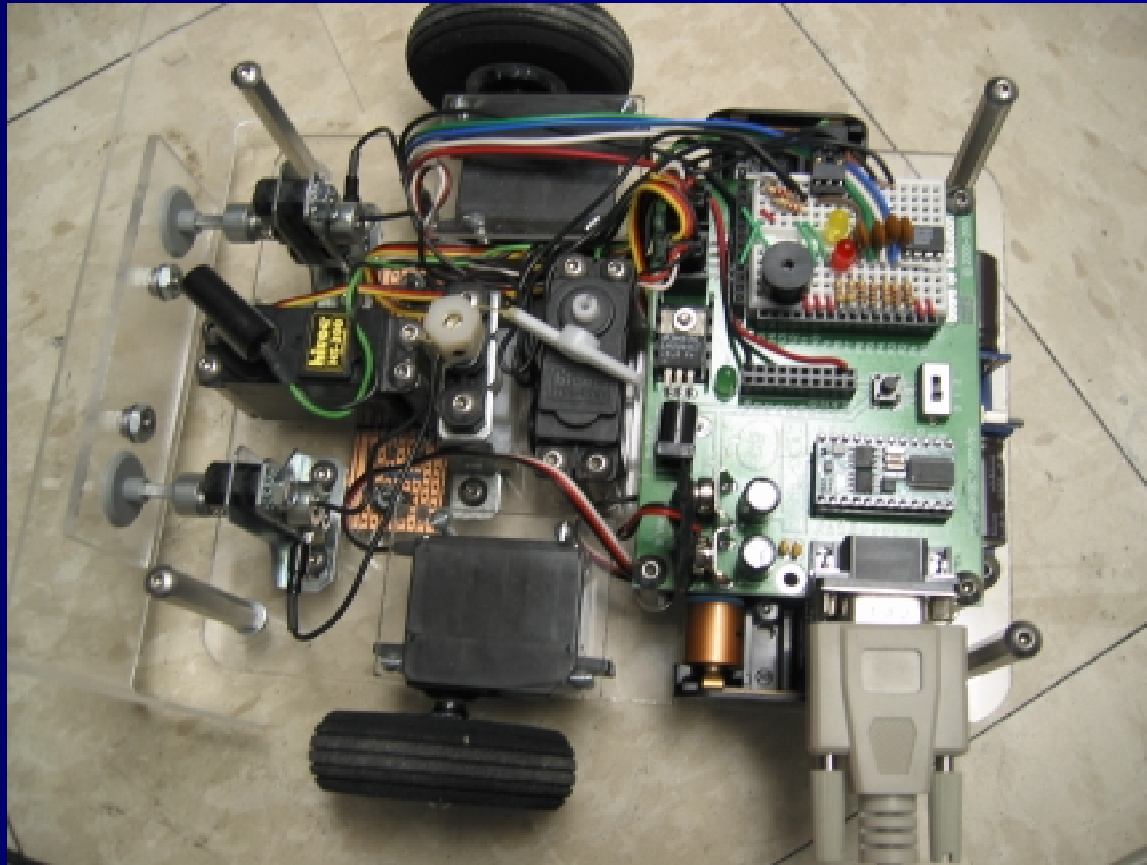
Pen Drop Simulator
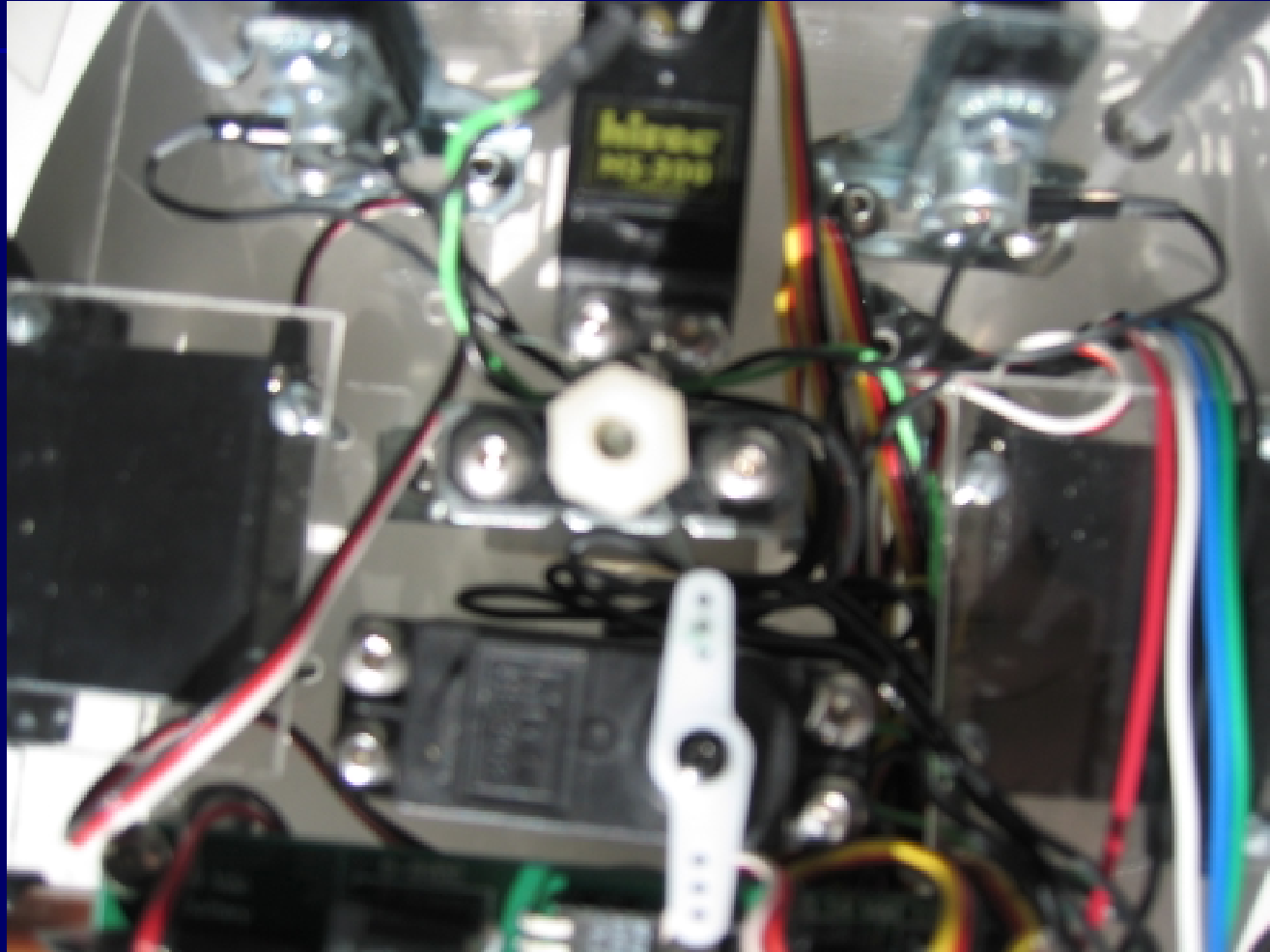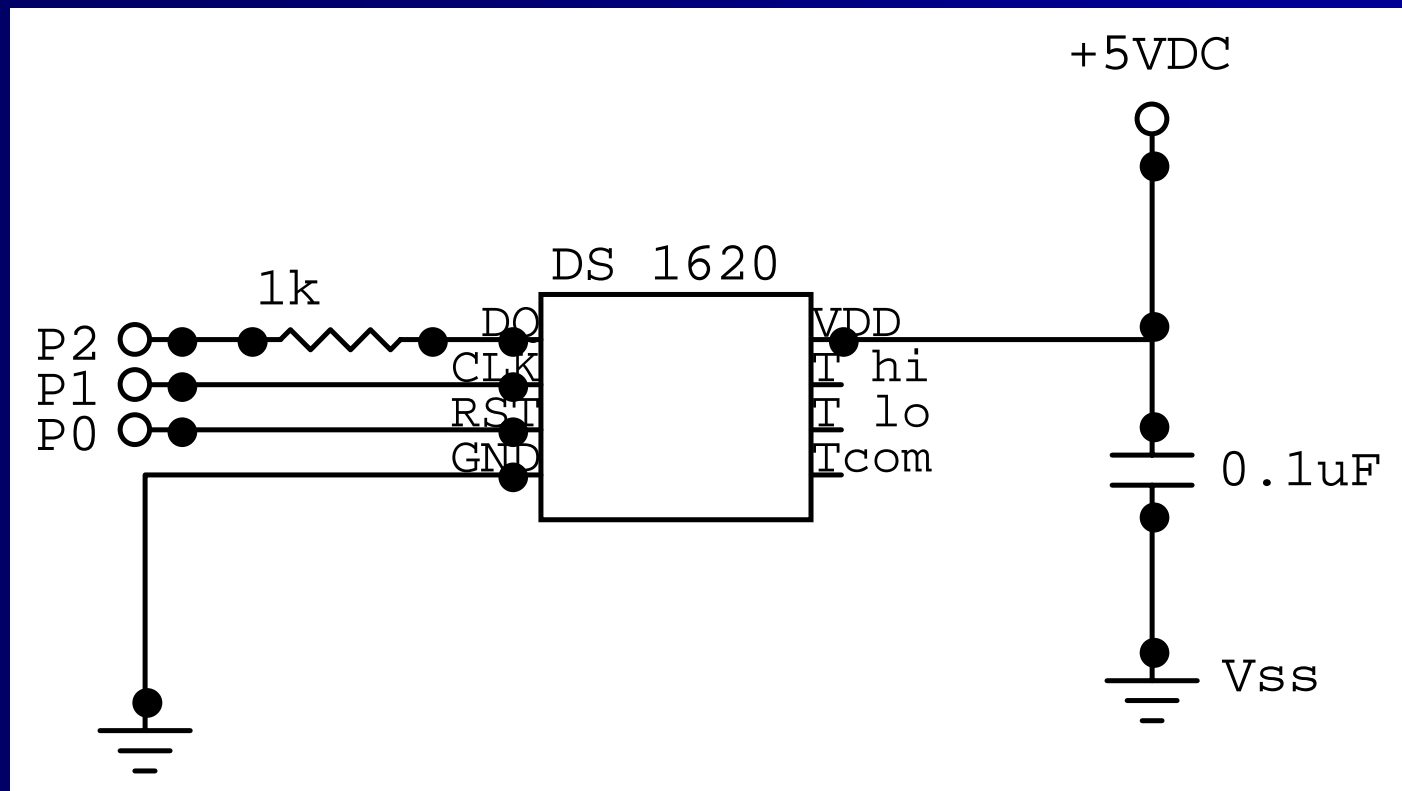
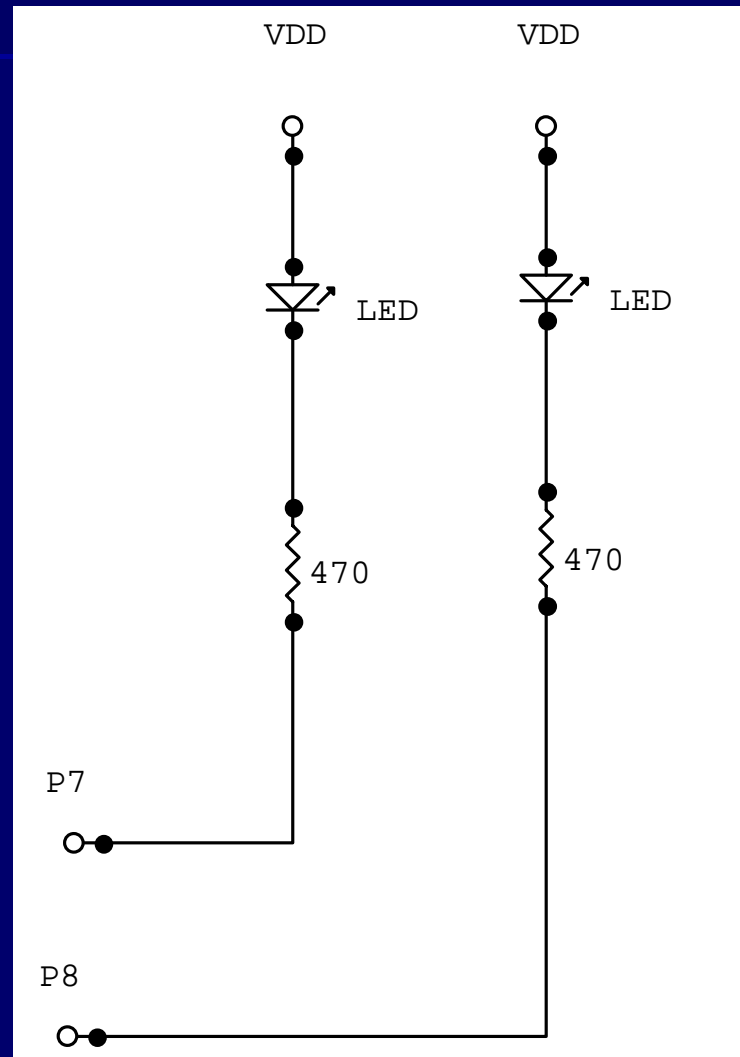# Front Bumper & Light Intensity Sensor
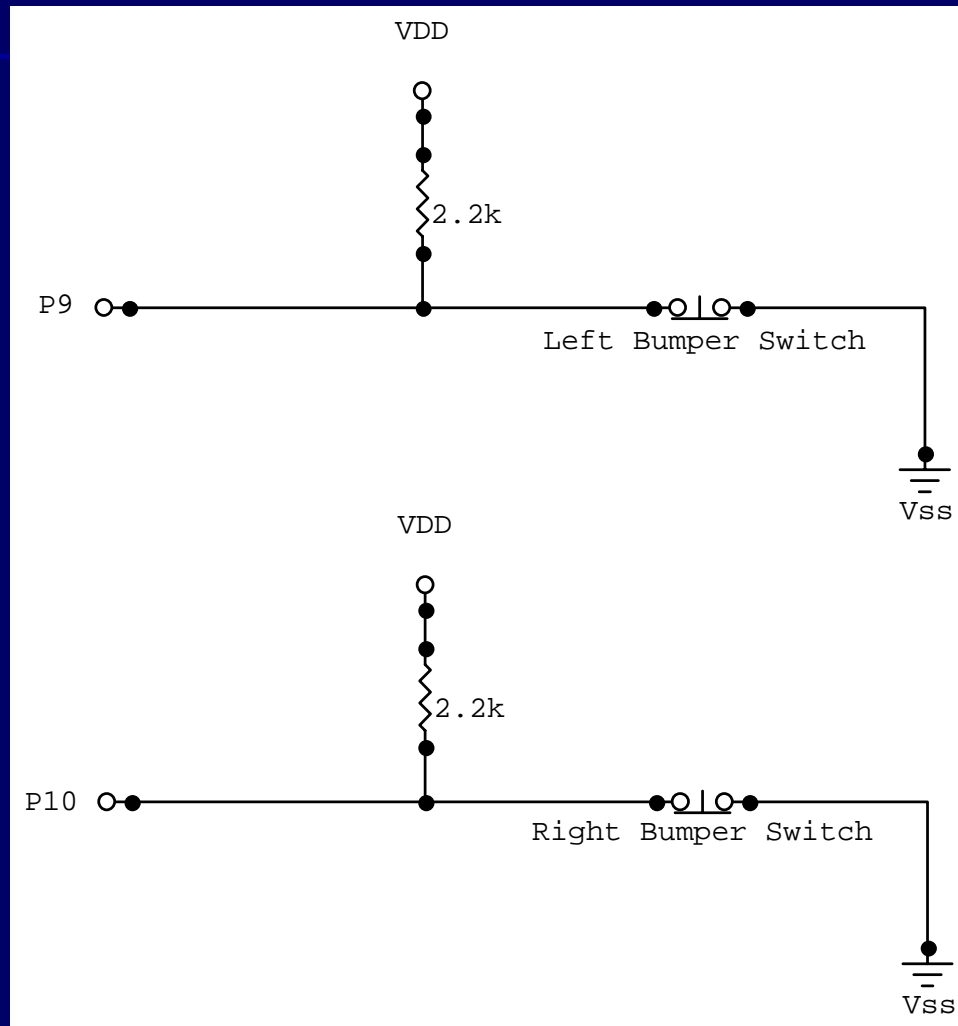
UV LEDs
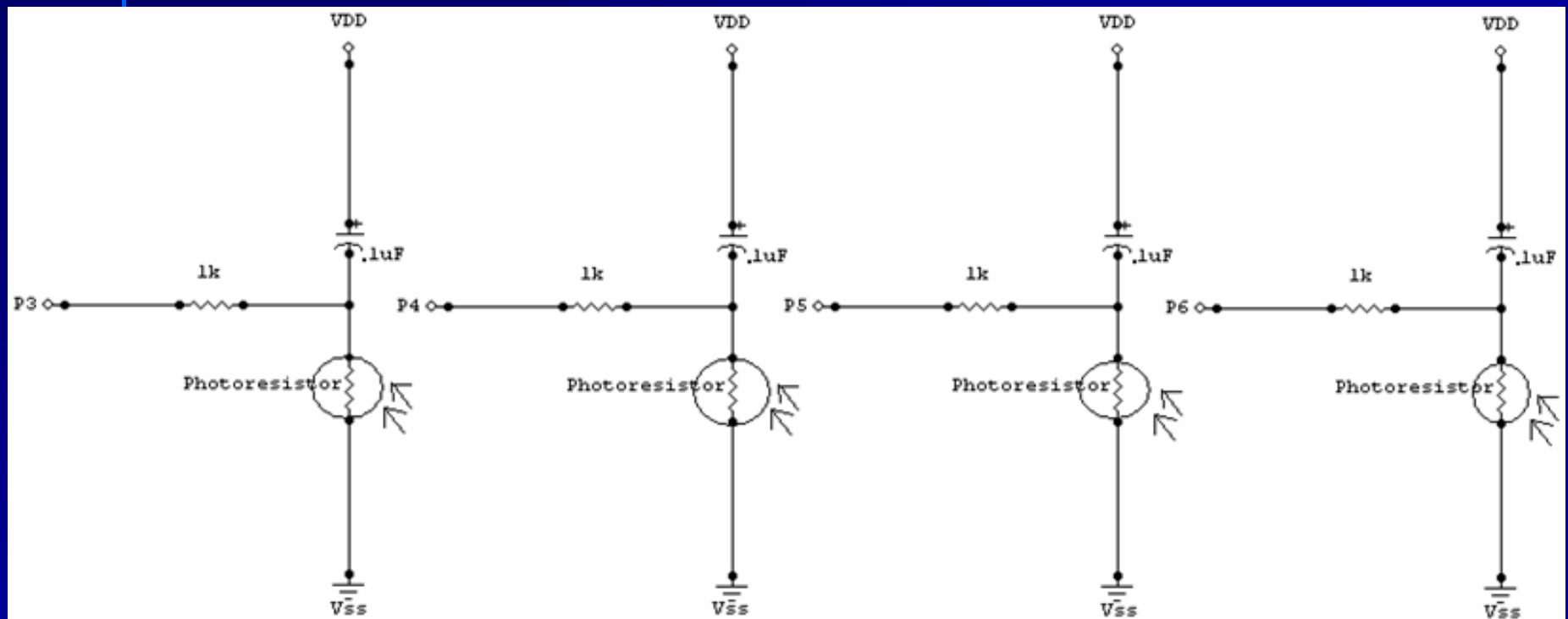
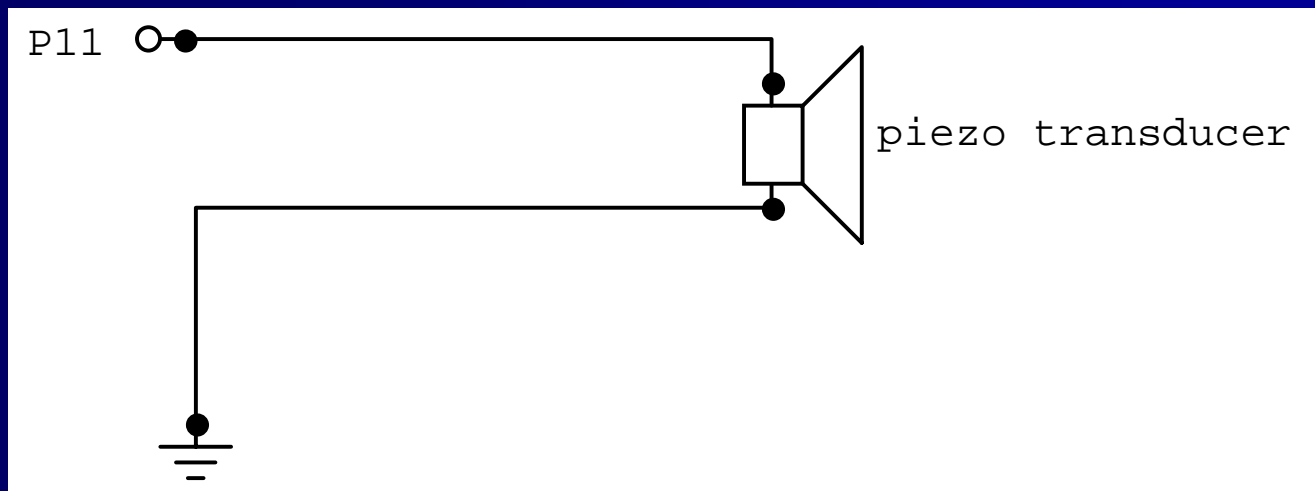# Bottom View

Temperature Sensor Circuitry

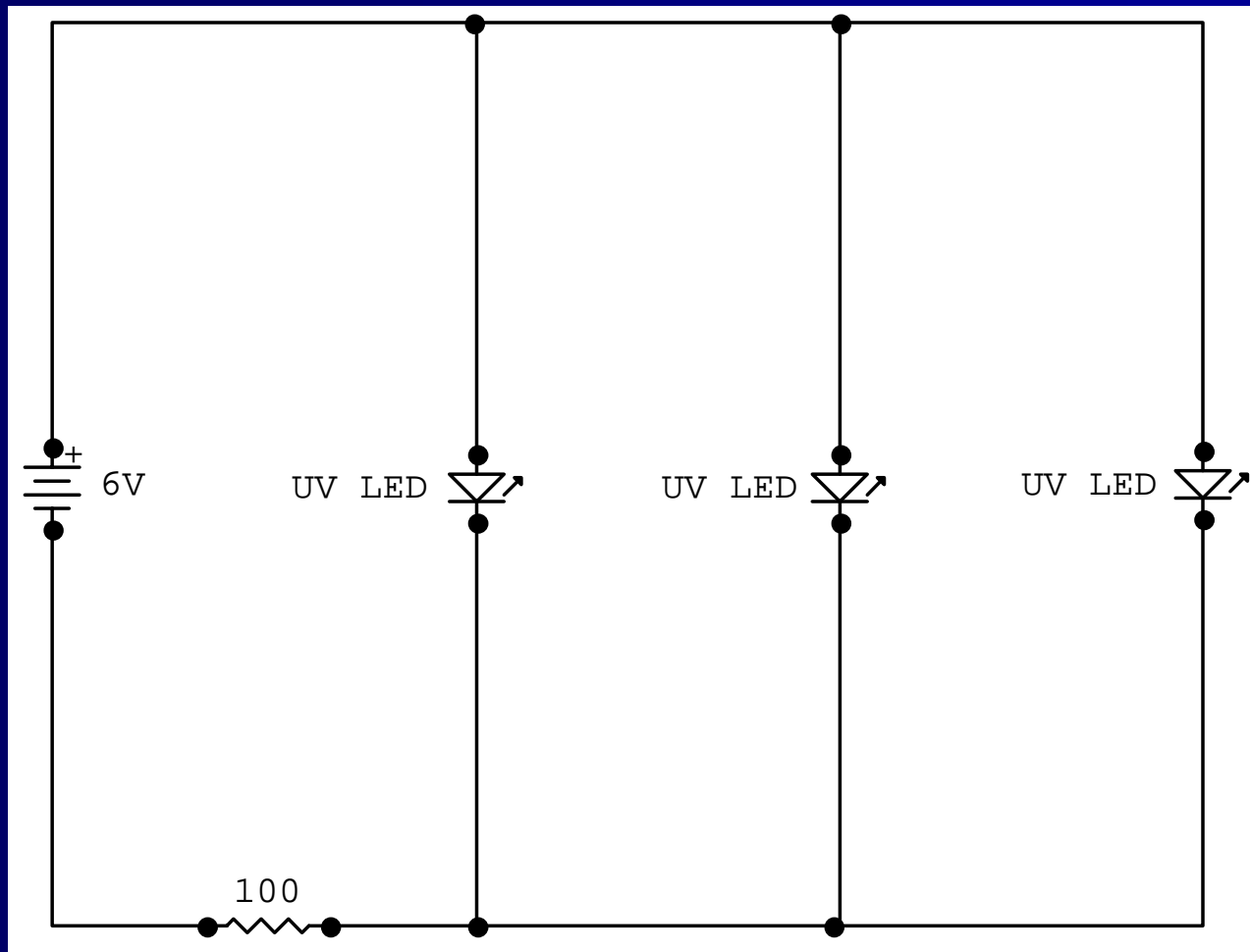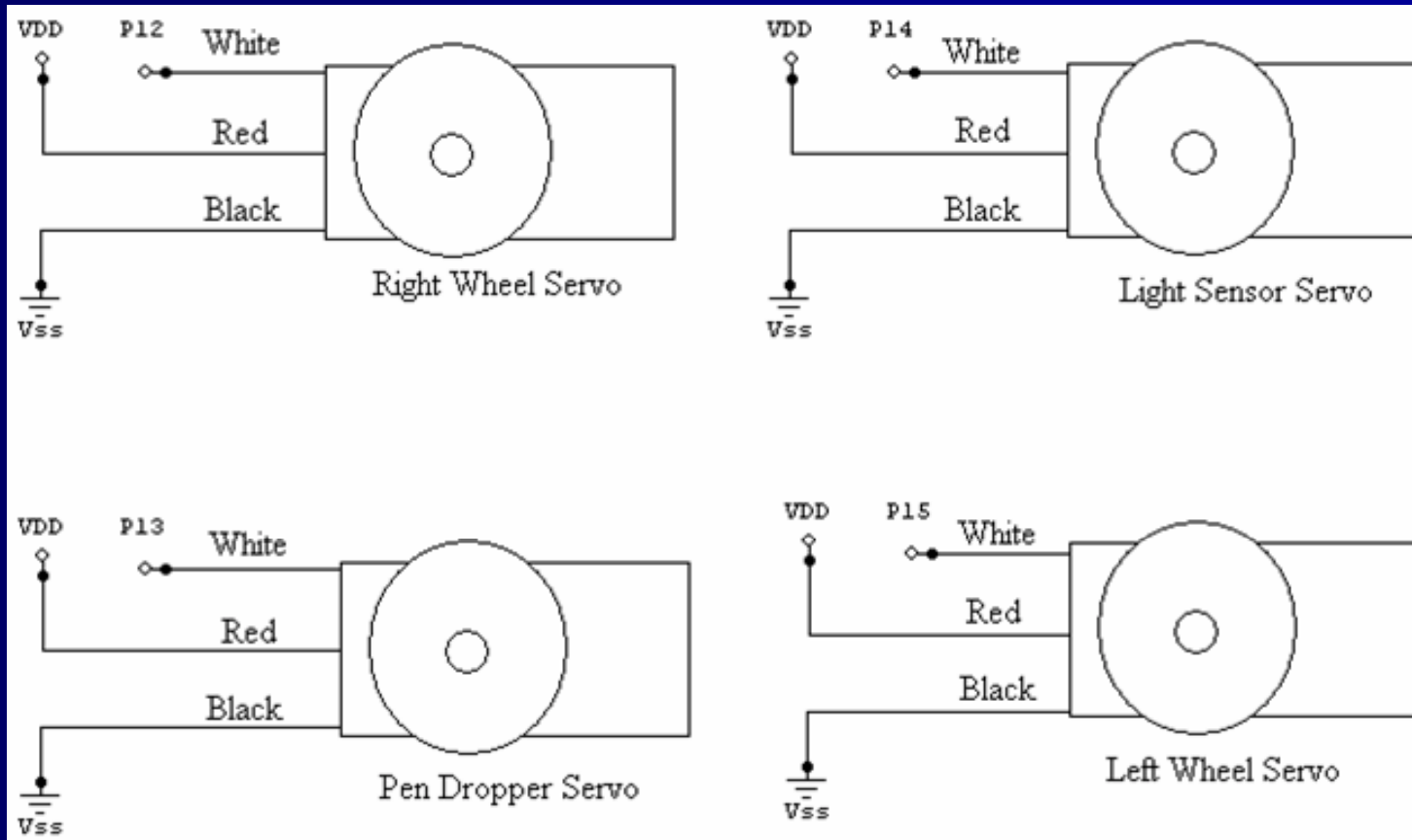# LED Circuitry

Switches Circuitry

Photoresistor Circuitry

Speaker Circuitry

P11 piezo transducer

UV LED Circuitry

Servo Circuitry

Software and Program Structure

- Food and Pheromone Releasing
- Line Tracing

Cost Estimate

- BS2 & Microcontroller kit   130.00
- 4 Servo motor (1 included in kit)   36.00
- 4 Photoresistors   0.80
- Plexiglas (12in.*12in.*1/8in.)   2.20
- Plexiglas (12in.*12in.*1/16in.)   2.10
- Wheels (2)   2.00
- Screws, nuts, and bolts   3.00
- Electronic parts   5.00
- Springs and Brackets   1.00
- Misc.   3.00
- **Total Cost**   **$185.10**
- **Mass Production Cost**   **$50.00**

Results

- Percentage of Goals completed: 70%
- Success rate: 90%

Problems & Possible Improvements

- Hardware:
  - More precise fluorescent light detecting mechanism

- Software:
  - Using the two remaining photoresistor for more precise line tracking
  - More development is required to perfect software

Applications

- Espionage/Military
- Ant Simulation
- Colonized Ant Simulation

Conclusion

- Construction of the robot was a success
- More time is required to fully utilize hardware of robot

Acknowledgements

- MicroParticle Photo Physics Lab(MP3L)
- Mishah Salman
- Wilmer Rengifo