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 its 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 (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.
Pen Drop Simulator
Front Bumper & Light Intensity Sensor
UV LEDs
Bottom View
Temperature Sensor Circuitry

DS 1620

+5VDC

0.1uF

Vss

1k

P2
P1
P0

DO
CLK
RST
GND

Thi
Tlo
Tcom
LED Circuitry

![LED Circuit Diagram]

- VDD
- LED
- 470 ohm resistor
- P7
- P8
Switches Circuitry

- **VDD**
  - P9
  - 2.2k
  - Left Bumper Switch

- **VSS**
  - P10
  - 2.2k
  - Right Bumper Switch
Photoresistor Circuitry
Speaker Circuitry

P11 ➔ piezo transducer
UV LED Circuitry
Servo Circuitry

![Diagram of servo circuitry including connections for Right Wheel Servo, Light Sensor Servo, Pen Dropper Servo, and Left Wheel Servo.](attachment:diagram.png)
Software and Program Structure

- Food and Pheromone Releasing
- Line Tracing
### Cost Estimate

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
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<tbody>
<tr>
<td>BS2 &amp; Microcontroller kit</td>
<td>130.00</td>
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<tr>
<td>4 Servo motor (1 included in kit)</td>
<td>36.00</td>
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<tr>
<td>4 Photoresistors</td>
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<td>Plexiglas (12in.*12in.*1/8in.)</td>
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<td>Plexiglas (12in.*12in.*1/16in.)</td>
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<td>Wheels (2)</td>
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<td>Screws, nuts, and bolts</td>
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<tr>
<td>Electronic parts</td>
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<tr>
<td>Springs and Brackets</td>
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<tr>
<td>Misc.</td>
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<td><strong>Total Cost</strong></td>
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<td><strong>Mass Production Cost</strong></td>
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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
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