SMART TRASH CANS

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Smart kitchen aids, smart power tools, smart home appliances, smart security system, etc.
SMART TRASH CANS

• Outline

• Current Trashcans
• Capacitance Sensors
• Capacitance based Trashcan
• Bill of materials for capacitance based trashcan
• Photoresistor and RCtime
• Photoresistor and Rctime based trashcan
• Bill of materials for Photoresistor and Rctime based trashcan
• Conclusions & Futureworks
**SMART TRASH CANS**


Smart Trash Cans  RFID-Based Recycling Technology Makes Philadelphia Greener


Recycling Without Sorting  Engineers Create Recycling Plant That Removes The Need To Sort
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- Aluminum Cans: Capacitance = 2.15
- Plastic Bottles: Capacitance = 2.0 - 2.15
- Paper Cups: Capacitance = 1.5
- Air: Capacitance = 1.5
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Equation 1
\[ C = \frac{Q}{V}, \quad C = \frac{dQ}{dV} \]

Equation 2
\[ C = \frac{\varepsilon_0 \varepsilon_r A}{d} \]

Equation 3
\[ C = \frac{\varepsilon_0 \varepsilon_r A}{w-d} \]

Capacitance = 2.15

Capacitance = 2.0 - 2.15
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![Graph showing capacitance over time with peaks labeled METAL and PLASTIC.]
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SMART TRASH CANS

<table>
<thead>
<tr>
<th>Bin 1</th>
<th>Bin 2</th>
<th>Bin 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic</td>
<td>Paper</td>
<td>Aluminum</td>
</tr>
</tbody>
</table>

![Images of three trash cans labeled for different materials: Bin 1 for plastic, Bin 2 for paper, and Bin 3 for aluminum.](image-url)
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Bill of Materials/Capacitance

- BS2 $240
- Cables $ 2.00
- Labor $200
- Trash Can $ 30.00
- Label Maker $ 25.00
- White Cardboard $ 15.00
- Trash $ 8.00
- Capacitance plates $ 10.00
- Tape $ 15.00
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- Plastic Bottle
  - Transparent Light
- Aluminum Can
  - Reflected Light
- Paper Cup
  - Scattering Light/Variable Reflectance
PHOTORESISTOR SMART TRASH CAN CONCEPT
SMART TRASH CAN DETAIL
SMART TRASH CANS
SMART TRASH CANS

[Diagram of a circuit involving ULTRASONIC SENSOR, PHOTORESISTOR, STANDARD SERVO, and LCD DISPLAY]
## SMART TRASH CANS

<table>
<thead>
<tr>
<th>Material</th>
<th>high time right</th>
<th>low time left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic Bottle</td>
<td>high = 05162</td>
<td>low = 04165</td>
</tr>
<tr>
<td></td>
<td>left = 12050</td>
<td>left = 09954</td>
</tr>
<tr>
<td>Aluminum Can</td>
<td>high = 42550</td>
<td>low = 34598</td>
</tr>
<tr>
<td></td>
<td>left = 19742</td>
<td>left = 14722</td>
</tr>
<tr>
<td>Paper Cup</td>
<td>high = 45538</td>
<td>low = 43780</td>
</tr>
<tr>
<td></td>
<td>left = 12542</td>
<td>left = 11417</td>
</tr>
</tbody>
</table>

Table 1: Experimental values extracted with the RCTime command for each photoresistor
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Bill Of Materials/ Photoresistor

- BS2 $240
- Cables $2.00
- Labor $200
- Light source with battery $30.00
- Trash Can $100.00
- Vex dirty parts kit $20.00 on ebay
- Duck tape $2.00
- Styrofoam $2.00
- White Cardboard $15.00
- Tape $5.00
Conclusions/ Future Work

*We have designed two trashcans with the same capabilities based on resistance and capacitance*

*This opens up some great simple ideas for smart trash cans in homes and schools*

*More people would become interested in science, technology, engineer, and recycling if they have this in their homes and schools*
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Lion Precision, “Capacitive Sensor Operation and Optimization,” St. Paul, MN., 2009


Dr. Vikram Kapila. Polytechnic Institute of New York University, 6 MetroTech Center, Brooklyn NY,11201, 2009. Mechatronics class, topics 4 and 6


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