MECHATRONICS
INTEGRATED PROJECT
SMART SHOPPING CART

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Problem: *Shopping with a heavy cart!*
Smart Cart: *How does it work?*

**Feature 1:** *Follow customer and avoid obstacles*
Smart Cart: *How does it work?*

**Feature 2: Calculation Mode**

- **Blue Button**: Stop following and enter calculation mode
- **Red 1**: Add fish to the cart
- **Red 2**: Add beef to the cart
- **Red 3**: Add Chicken to the cart

Item cost is displayed in Line 1
Total is displayed in Line 2

Press **Blue Button** to start tracking mode again
Logic diagram – **Tracking Mode:**

- **Tracking mode**
  - Initialize servo
  - blink LED
  - sense IR direction
  - **Tilt**
    - **No**
      - ping
    - **Yes**
      - **Tilt?**
        - **No**
          - **Stop**
        - **Yes**
          - go straight a little
  - **Left**
    - **No**
      - ping
    - **Yes**
      - **Tilt?**
        - **No**
          - turn left a little
        - **Yes**
          - turn-motor right a little
  - **Right**
    - **No**
      - ping
    - **Yes**
      - **Tilt?**
        - **No**
          - wait 1s
        - **Yes**
          - slow button pushed

- **Stop**
- **Enter calculation mode**
- **No IR signal**
- **Obstacle or no one is using**
Logic diagram – **Calculation Mode:**

1. Calculation mode
2. Initialize LCD
3. Blink LEDs twice
4. B1 pressed? (no: go to yes)
   - yes: Add fish price
5. B2 pressed? (no: go to yes)
   - yes: Add beef price
6. B3 pressed? (no: go to yes)
   - yes: Add chicken price
7. Blue bit pressed?
   - yes: Blink LEDs three times
8. Enter tracking mode
Circuit:
Design for safety

Hardware:
• Power switch.
• Reset button.

Software:
• Design philosophy “stop first, passive guidance”.
• Stop first: It will only take action for the exact programmed condition.
  • This design philosophy decreases the possibility of non-normal performance.
• Passive guidance: It will only be activated when customer is at the correct position.
  • Do not allow the cart randomly go straight, turn around, to find its customer if target is lost.
  • This design philosophy decrease the possibility of collision and helps protect other customers.
Working Demo
# How Much Does It Cost?

**Cost of Manufacture:**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>QUANTITY</th>
<th>COST ($)</th>
<th>COST FOR MASS MANUFACTURING ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS2 BOARD OF EDUCATION</td>
<td>1</td>
<td>69.99</td>
<td>49.99</td>
</tr>
<tr>
<td>I/R SENSOR</td>
<td>2</td>
<td>1.98</td>
<td>1.49</td>
</tr>
<tr>
<td>PING SENSOR</td>
<td>1</td>
<td>22.49</td>
<td>17.99</td>
</tr>
<tr>
<td>SERIAL LCD</td>
<td>1</td>
<td>27.99</td>
<td>21.00</td>
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<tr>
<td>CART</td>
<td>1</td>
<td>-(19.99)</td>
<td>EXISTING(14.99)</td>
</tr>
<tr>
<td>WHEELS</td>
<td>2</td>
<td>7.99</td>
<td>6.99</td>
</tr>
<tr>
<td>SERVO MOTOR</td>
<td>3</td>
<td>51.99</td>
<td>34.99</td>
</tr>
<tr>
<td>LED</td>
<td>4</td>
<td>2.99</td>
<td>2.49</td>
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<tr>
<td>BREADBOARDS</td>
<td>4</td>
<td>10.99</td>
<td>5.99</td>
</tr>
<tr>
<td>I/R EMITTER</td>
<td>1</td>
<td>1.99</td>
<td>1.49</td>
</tr>
<tr>
<td>BATTERY</td>
<td>4</td>
<td>6.99</td>
<td>4.99</td>
</tr>
<tr>
<td>MISCELLANEOUS</td>
<td>-</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>208.4</strong></td>
<td><strong>153.41</strong></td>
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</table>

*Source: Parallax website*
Future Improvement

• Better circuitry (Arduino Mega) and sensors
• Coded IR emitters and sensors
• Bar-code scanner or RFID
• More rugged wheels
• Budget alert feature
Conclusion:

OTHER USES:

• A robot that could escape from a maze
• A robot that aids with disaster relief
• A robot that will chase the ball