Final Class – Study Outline

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12 December 2005
Outline

• Analysis of Design Competition
• Discussion of Multi-Band-Gap Optimization
• Discussion of Motor/Cell Matching HW
• Overview of Expectations for Final
Basic Results

Team 1

Team 2

Team 3

Team 4
Velocity Results

\[ y = -0.0056x + 2.69 \]
\[ R^2 = 0.9577 \]

\[ y = -0.0181x + 6.8109 \]
\[ R^2 = 0.9649 \]

\[ y = -0.0262x + 5.8606 \]
\[ R^2 = 0.9364 \]

\[ y = -0.0037x + 2.6214 \]
\[ R^2 = 0.4006 \]
Feet/sec = slope(grams) + intercept

<table>
<thead>
<tr>
<th>Team</th>
<th>slope of velocity with weight</th>
<th>intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.0056</td>
<td>2.69</td>
</tr>
<tr>
<td>2</td>
<td>-0.0181</td>
<td>6.81</td>
</tr>
<tr>
<td>3</td>
<td>-0.0262</td>
<td>5.86</td>
</tr>
<tr>
<td>4</td>
<td>-0.0073</td>
<td>3.604</td>
</tr>
</tbody>
</table>
Optimization Analysis

\[ \text{Score} = \frac{\text{Dist} \times \text{Mass}}{\text{Time}} \]

\[ \text{Score} = \text{Velocity} \times \text{Mass} \]

\[ \text{Velocity} = A \times M + B \]

\[ \text{Score} = A \times M^2 + B \times M \]

Zeros at: \( M=0 \) and \( M=-\frac{B}{A} \)

\[ \text{PeakScore} = \frac{-B}{2A} \]
# Peak Estimates

<table>
<thead>
<tr>
<th>Team</th>
<th>Best weight to Use (grams)</th>
<th>Best score (estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>240</td>
<td>323</td>
</tr>
<tr>
<td>2</td>
<td>188</td>
<td>641</td>
</tr>
<tr>
<td>3</td>
<td>112</td>
<td>328</td>
</tr>
<tr>
<td>4</td>
<td>247</td>
<td>445</td>
</tr>
</tbody>
</table>
# Design Factors

<table>
<thead>
<tr>
<th>Team</th>
<th>Wiring</th>
<th>Gearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2+2</td>
<td>1:6</td>
</tr>
<tr>
<td>2</td>
<td>Series</td>
<td>1:4</td>
</tr>
<tr>
<td>3</td>
<td>Series</td>
<td>1:1</td>
</tr>
<tr>
<td>4</td>
<td>2+2</td>
<td>1:3</td>
</tr>
</tbody>
</table>
Correlations
Project Conclusions

• Full Series Wiring Better
• Higher RPM for Motor Better
• Reduce Friction
• Tilting Toward Sun Important
• Reflectors Acted as Sails
Study Topics

- Multi-Junction Optimization
- DC Motors Characteristics
- Project Work and Analysis of Results
- Organic Photovoltaics
- Dye Sensitized Solar Cells
- Nano-Rod Solar Cells
- Motor Matching with Solar Cell
- Transparent Conductor Behavior
- Matching Absorption Depth to pn-Junction Depletion
- Patent Discussions and Ideas