Motion Analysis of the 2009 Men’s 100 m World Record

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Some characteristics

• start acceleration: 6.80 m/s²
• average speed: 10.44 m/s
• top speed: 12.27 m/s at 7.6 s and 76 m
• speed at finish: 11.16 m/s

Evaluation of IAAF split timing data

<table>
<thead>
<tr>
<th>Position / m</th>
<th>0 m</th>
<th>10 m</th>
<th>20 m</th>
<th>30 m</th>
<th>40 m</th>
<th>50 m</th>
<th>60 m</th>
<th>70 m</th>
<th>80 m</th>
<th>90 m</th>
<th>100 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAAF / s</td>
<td>0.146</td>
<td>1.89</td>
<td>2.88</td>
<td>3.78</td>
<td>4.64</td>
<td>5.47</td>
<td>6.29</td>
<td>7.10</td>
<td>7.92</td>
<td>8.75</td>
<td>9.58</td>
</tr>
<tr>
<td>Video, own /</td>
<td>0.18</td>
<td>1.81</td>
<td>3.31</td>
<td>4.18</td>
<td>5.03</td>
<td>5.88</td>
<td>6.58</td>
<td>7.28</td>
<td>7.98</td>
<td>8.68</td>
<td>9.58</td>
</tr>
</tbody>
</table>

Video-based data show a complete lack of fit in a(t), and must be erroneous

If Bolt had not slowed down →

Discussion

• Split timing s(t)-data fitted very well and gave consistent v(t)-, a(t)-curves
• a video-based analysis failed for lack of on-track distance markers
• Bolt’s run was near-perfect for him, and confirmed an extrapolation² of his Beijing 2008 world record (9.69 s)
• Powell (the second in that final) started faster by 0.012 s, but was beaten by Bolt’s higher top speed
• improvements are expected to be
  – up to 0.05 s by faster start & acceleration
  – less than 0.05 s by maintaining the present-day top speeds to the finish line


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