Design of a Low-Cost Platform for Autonomous Mobile Service Robots

University of Pennsylvania

IJCAI 2016 Workshop on Autonomous Mobile Service Robots
**Goal:** design a low-cost, easily creatable, open source service robot platform
Low-Cost Service Robot Platform

Built on TurtleBot 2 base

Enhanced computation
- Intel NUC core i5 or i7
- COTS external battery

Shoulder-height touchscreen
- Nexus 7 (or other) tablet
- Interaction/telepresence

Improved perception
- Hokuyo LIDAR
- Top-mounted 3D camera

Low-cost modular arm
- 3D-printed / laser-cut

Eaton, et al.  
http://www.seas.upenn.edu/~eeaton/projects/servicerobot/
Modular Low-Cost Robot Arm

- 3D-printed PLA, laser-cut PLA
- Dynamixel servos
- Easy to assemble
- Modular gripper
  - Parallel jaw gripper
  - Compliant gripper
- Arduino controller / ROS

### Table 2: Low-cost robotic arms, with our DesiArm highlighted in blue.

<table>
<thead>
<tr>
<th></th>
<th>PhantomX Reactor</th>
<th>DesiArm</th>
<th>WidowX Mark II</th>
<th>[Quigley et al.]</th>
<th>Dr. Robot Jaguar</th>
<th>Cyton Gamma 1500</th>
<th>Universal Robots UR3</th>
<th>KUKA Youbot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost</td>
<td>$550</td>
<td>$850</td>
<td>$1,500</td>
<td>$4,135</td>
<td>$8,750</td>
<td>$12,000</td>
<td>$23,000</td>
<td>$24,200</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Total weight (Kg)</td>
<td>1.36</td>
<td>0.75</td>
<td>1.33</td>
<td>11.4</td>
<td>10</td>
<td>2</td>
<td>11</td>
<td>7.4</td>
</tr>
<tr>
<td>Max Payload (Kg)</td>
<td>0.6</td>
<td>1.4</td>
<td>0.8</td>
<td>2</td>
<td>4</td>
<td>1.5</td>
<td>3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

http://www.seas.upenn.edu/~eeaton/projects/servicerobot/