MoveIt! Survey Results

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SRI International
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(Available electronically from: moveit.ros.org)

Total no. of respondents: 105*
Total no. of different types of robots using MoveIt!: 65^
General Information

Which describes you best?

Academic Faculty/Post-doc 20 18%
Graduate Student 44 39%
Undergraduate Student 5 4%
Government Research Lab / Non-Profit R&D Lab 15 13%
Industry R&D 19 17%
Industry Professional 4 4%
Hobbyist 5 4%
Other 0 0%

Do you use MoveIt!??

Yes, I use (or have used) MoveIt! 96 86%
No, but I use or have used Arm Navigation 9 8%
No, but I am interested in using MoveIt! 7 6%
MoveIt! Usage

**How do you use MoveIt!**

- With a real physical robot: 89 (36%)
- With simulated robots: 69 (28%)
- Using the Rviz Visualizer: 85 (35%)
- Other: 3 (1%)

**How would you describe your use of MoveIt!?**

- I develop basic algorithms (e.g. motion planning or collision checking) using MoveIt! as a platform: 52 (28%)
- I develop applications for my robot (e.g. pick and place, door opening, etc.) using the capabilities in MoveIt!: 73 (39%)
- I use MoveIt! as part of a large R&D program or project for integrated applications, e.g. search and rescue, logistics: 37 (20%)
- I use MoveIt! for industrial applications (e.g. painting, assembly, welding, etc.): 18 (10%)
- Other: (Education, Fun): 6 (3%)
Please list the names of other software offering similar capabilities to MoveIt! that you may have used

OpenRave - Open Robotics Automation Virtual Environment 51 35%
OMPL App 31 21%
OOPSMP 1 1%
MPK - Motion Planning Kit 3 2%
Motion Strategy Library 2 1%
Delmia/CATIA 6 4%
KineoCAM 4 3%
N/A 37 25%
Other: (Choreonoid, OMPL App, RoboStudio, GraspIt!, MPK, Karto, MSL, V-Rep, Kinematix, RoboGuide) 12 8%
What kind of robots are you using MoveIt! with?

- Robot Arm(s): 71 (37%)
- Mobile Base: 17 (9%)
- PR2: 24 (12%)
- Mobile Manipulation Robots (Other than PR2): 40 (21%)
- Biped: 6 (3%)
- Quadruped: 1 (1%)
- Humanoid: 29 (15%)
- Other: (UAVs, Lego NXT, Quadrotor): 6 (3%)
Which features of MoveIt! are you currently using?

Motion Planning 102 20%
Kinematics 81 16%
Trajectory Processing 69 14%
Geometric Constraints 45 9%
Collision Checking 87 17%
Planning Scene 70 14%
Integrated 3D Perception (e.g. Octomap, integration with object recognition, etc.) 44 9%
Other 1 0%

Which feature of MoveIt! do you find most useful?

Motion Planning 61 54%
Kinematics 8 7%
Trajectory Processing 2 2%
Geometric Constraints 2 2%
Collision Checking 15 13%
Planning Scene 9 8%
<table>
<thead>
<tr>
<th>Interface</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct C++ library interface</td>
<td>59</td>
<td>23%</td>
</tr>
<tr>
<td>ROS Interfaces</td>
<td>89</td>
<td>35%</td>
</tr>
<tr>
<td>Python wrappers</td>
<td>31</td>
<td>12%</td>
</tr>
<tr>
<td>Rviz Motion Planning GUI</td>
<td>77</td>
<td>30%</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Which interfaces that MoveIt! provides are you using?**
What kind of applications are you using MoveIt! for?

- Pick and place: 72 (24%)
- Workspace Analysis for Robot Design: 13 (4%)
- Single-arm manipulation tasks: 83 (28%)
- Dual-arm manipulation tasks: 39 (13%)
- Navigation: 23 (8%)
- Mobile Manipulation Tasks: 36 (12%)
- Locomotion (Walking, etc.): 8 (3%)
- Tele-operation - Human in the loop: 22 (7%)
- Other: 2 (1%)
MoveIt! Setup Assistant

What was your overall experience with the MoveIt! Setup Assistant

Very Positive [57]
Extremely Pos [9]
Not all all P [1]
Slightly Pos [10]

Moderately P [35]
Not all all Positive 1 1%
Slightly Positive 10 9%
Moderately Positive 35 31%
Very Positive 57 51%
Extremely Positive 9 8%

What was your overall experience with setting up MoveIt!, including the additional steps AFTER the Setup Assistant such as setting up controllers and sensors?

Very Positiv [27]
Extremely Pos [3]
Not all all P [6]
Slightly Pos [30]

Moderately P [46]
Not all all Positive 6 5%
Slightly Positive 30 27%
Moderately Positive 46 41%
Very Positive 27 24%
Extremely Positive 3 3%
How much do you think the Setup Assistant helped in speeding up the setup of your robot for MoveIt!?

![Pie chart showing the distribution of responses.]

<table>
<thead>
<tr>
<th>Help Level</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely helpful</td>
<td>24</td>
<td>21%</td>
</tr>
<tr>
<td>Very helpful</td>
<td>55</td>
<td>49%</td>
</tr>
<tr>
<td>Moderately helpful</td>
<td>22</td>
<td>20%</td>
</tr>
<tr>
<td>Slightly helpful</td>
<td>8</td>
<td>7%</td>
</tr>
<tr>
<td>No help</td>
<td>3</td>
<td>3%</td>
</tr>
</tbody>
</table>

How much insight into various MoveIt! concepts did you gain by using the Setup Assistant?

![Pie chart showing the distribution of responses.]

<table>
<thead>
<tr>
<th>Insight Level</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very insightful</td>
<td>16</td>
<td>14%</td>
</tr>
<tr>
<td>Moderately insightful</td>
<td>58</td>
<td>52%</td>
</tr>
<tr>
<td>Slightly insightful</td>
<td>28</td>
<td>25%</td>
</tr>
<tr>
<td>Not insightful</td>
<td>6</td>
<td>5%</td>
</tr>
</tbody>
</table>

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Future Developments

What should be improved about MoveIt!?

<table>
<thead>
<tr>
<th>Category</th>
<th>Votes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capabilities</td>
<td>34</td>
<td>12%</td>
</tr>
<tr>
<td>Integrated Applications</td>
<td>17</td>
<td>6%</td>
</tr>
<tr>
<td>Documentation (Wiki)</td>
<td>88</td>
<td>32%</td>
</tr>
<tr>
<td>Interfaces</td>
<td>30</td>
<td>11%</td>
</tr>
<tr>
<td>Tutorials</td>
<td>77</td>
<td>28%</td>
</tr>
<tr>
<td>Support for robots</td>
<td>19</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>3%</td>
</tr>
</tbody>
</table>
What capabilities would you like to see in MoveIt!?

- Integrated controller stack: 32% (32) 8%
- Fully integrate the ROS navigation stack: 43% (43) 11%
- Learning from Demonstration: 36% (36) 9%
- Walking: 11% (11) 3%
- Whole-body planning and control: 42% (42) 11%
- Visual Servoing: 43% (43) 11%
- Planning with Dynamics: 38% (38) 10%
- Better integration with other types of Sensing (e.g. proprioceptive, etc.): 17% (17) 4%
- Calibration: 44% (44) 11%
- Shared Autonomy Capabilities: 10% (10) 3%
- Reactive Planning and Control for safer operation in human environments: 45% (45) 12%
- Cycle-time Optimization for Manipulation Tasks: 16% (16) 4%
- Other: (Gazebo/Bullet support, Multi-robot): 6% (6) 2%
What kinds of integrated applications would you like to see in MoveIt!?

- Generalized Pick and Place: 70 (35%)
- Workspace Analysis: 43 (21%)
- Assembly Tasks: 24 (12%)
- Mobile Pick and Place: 60 (30%)
- Other: (Constrained paths, high-precision paths) 4 (2%)

What kind of user interfaces would you like to see in MoveIt!?

- Improve the C++ interface: 64 (25%)
- Better Python interfaces: 37 (15%)
- Better ROS interface: 61 (24%)
- GUI based interfaces: 42 (16%)
- Web interfaces: 20 (8%)
- Tablet interfaces: 14 (5%)
- Multi-dof Input Devices (e.g. Razer Hydra, etc.): 14 (5%)
- Other: 3 (1%)
Would you be interested in a cloud-based implementation of MoveIt!

Yes 33 29%
No 79 71

Keep Scrolling Down:
Next two pages contain full list of robots using MoveIt!
Robots Using MoveIt!

Compiled list of robots running MoveIt! based on survey responses. The list is in alphabetical order and figures in brackets indicate the number of respondents who reported using MoveIt! with that particular robot.

**Total Number of different robots: 65**

- ABB IRB2400
- ABB IRB6640
- Aldebaran Nao (2)
- Aldebaran Romeo
- Arbotix PhantomX Pincher
- Barrett WAM
- Boston Dynamics Atlas (7)
- BioRob Arm
- Cerberus
- CKBot
- ClamArm
- CloPeMa Robot
- Comau NM45
- Cyton Veta
- Demining robot
- Denso robot (vs060)
- DIY Mobile Manipulator
- DLR-HIT Hand
- Dr. Robot
- Fanuc m10ia
- Fraunhofer Care-O-bot
- Fraunhofer Rob@Work
- HDT arm with Base for RCTA project Rescuer
- Hiro (Nextage)
- Hoap3
- HRP-4 (simulation) (3)
- HRP2
- Hubo
- iarm ABB
- iCub
- iRB2400
- Kawada Hiro
- Kinova Jaco (3)
- Korus Homemate robot
- KUKA LBR (3)
- Kuka Leightweight Arm (7)
- KUKA LWR4
- KUKA OmniRob
- KUKA youBot (2)
- Lego NXT
- Lyncmotion servo erector set
Meka M3 Robot (2)
Motoman SIA10d (2)
Motoman SIA20 (2)
Motoman SIA5
Neuronics Katana (2)
PAL Robotics REEM (2)
PAL Robotics REEM-C
Pi Robot
Pioneer P3AT
Pisa Velvet Gripper
Willow Garage PR2 (16)
Rethink Robotics Baxter (8)
Robonaut
Robonaut2
Schunk 7DOF
Schunk Dextreous Hand
Schunk LWA (3)
Schunk Powerball
Shadow Robot Arm and Hand
Summit XL-Terabot
TUM Rosie
Universal Robots UR10 (2)
Universal robot UR5 (7)
X-WAM