Robot Gesture Engine

Rachel Holladay
Siddhartha Srinivasa

The Robotics Institute
Carnegie Mellon University
Personal Robotics Laboratory
Hardware and Software Platform to Enable Computing Research in HRI
Hardware and *Software* Platform to Enable Computing Research in HRI
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*Through a Gesture Library*
Key Contribution: Robot Gesture Engine (RoGuE)
<table>
<thead>
<tr>
<th>Literature Review</th>
<th>Mathematical Formulation</th>
<th>Robotic Systems</th>
</tr>
</thead>
</table>

\[
\begin{bmatrix}
x_{\text{min}} & x_{\text{max}} \\ y_{\text{min}} & y_{\text{max}} \\ z_{\text{min}} & z_{\text{max}} \\ \psi_{\text{min}} & \psi_{\text{max}} \\ \theta_{\text{min}} & \theta_{\text{max}} \\ \phi_{\text{min}} & \phi_{\text{max}}
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<tr>
<th>Kendon</th>
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<th>Efron</th>
<th>Identifying Characteristics</th>
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<tbody>
<tr>
<td>physiographic</td>
<td>iconic</td>
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<td>kinetographic</td>
<td>picture the content of speech</td>
</tr>
<tr>
<td>ideographic</td>
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<td>gesticulation</td>
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<td>autonomous</td>
<td>symbolic</td>
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<td>symbolic/</td>
<td>standardized gestures, complete within themselves, without speech</td>
</tr>
<tr>
<td>gestures</td>
<td></td>
<td></td>
<td>emblematic</td>
<td></td>
</tr>
<tr>
<td>— none —</td>
<td>deictic</td>
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Presenting  Pointing  Exhibiting  Sweeping
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    \phi_{\text{min}} & \phi_{\text{max}}
\end{bmatrix}
\]
$T_w^0 \quad T_e^w \quad B_w$
$T_w^0$
$T^0_w$

TSR Frame (W)

Origin (0)
\( T_0^w \)

TSR Frame \((W)\)

Origin \((0)\)
$T^w_e$
$T_e^W$
$T^w_e$
$B_w$
$B_w$
$B_w$
$B_w$
$B_w$
$B_w$

\begin{align*}
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  z_{\text{min}} & z_{\text{max}} \\
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  \phi_{\text{min}} & \phi_{\text{max}}
\end{bmatrix}
\end{align*}
End Effector
Assumptions
End Effector Assumptions

Reference Assumptions
Presenting
\( T_w^0 \)
$T_w^e$
$B_w$
\[
\begin{bmatrix}
0 & 0 & 0 \\
0 & 0 & 0 \\
-\pi & 0 & \pi \\
0 & 0 & 0
\end{bmatrix}
\]

Pitch
Pointing
Exhibiting

Created by Takao Umehara from Noun Project
Planning Call #1: Grasping
Planning Call #1: Grasping
Planning Call #2: Exhibiting
Planning Call #2: Exhibiting
Planning Call #3: Exhibiting
Sweeping
Planning Call #1: Place Hand
Planning Call #1: Place Hand
Planning Call #2: Sweeping
Planning Call #2: Sweeping
**Literature Review**

**Mathematical Formulation**

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**Robotic Systems**
def Present_HERB(robot, focus, arm):
    present_tsr = robot.tsrlibrary('present', focus, arm)
    robot.PlanToTSR(present_tsr)
    preshape = {finger1=1, finger2=1,
                finger3=1, spread=3.14}
    robot.arm.hand.MoveHand(preshape)

def Present_ADA(robot, focus, arm):
    present_tsr = robot.tsrlibrary('present', focus, arm)
    robot.PlanToTSR(present_tsr)
    preshape = {finger1=0.9, finger2=0.9}
    robot.arm.hand.MoveHand(preshape)
```python
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www.personalrobotics.ri.cmu.edu