Exploring Human-Co-Robot Interactions: Real-time Feedback or not?

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Dr. Tucker holds a joint appointment as Assistant Professor in Engineering Design and Industrial Engineering at The Pennsylvania State University. He is also affiliate faculty in Computer Science and Engineering. He teaches Introduction to Engineering Design (EDSGN 100) at the undergraduate level and developed and taught a graduate-level course titled Data Mining–Driven Design (EDSGN 561). As part of the Engineering Design Program’s ”Summers by Design” (SBD) program, Dr. Tucker supervises students from Penn State during the summer semester in a two-week engineering design program at the École Centrale de Nantes in Nantes, France.

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Introduction

Grand Engineering Challenges of the 21st century: Development of Personalized Learning

In traditional learning environments, instructors are able to provide personalized and real-time feedback based on the facial or body language cues students project. As well as their performance on the task at hand.

Unfortunately, this personalized assistance and real-time feedback is difficult to achieve where in-person interactions are challenging, or the student to instructor ratio is high. (e.g., E-learning, Eng. Laboratories)

Current Research State

Current online learning environments can provide real-time performance feedback (e.g., online quiz). Moreover, due to the advancements in sensor and computer vision technology, current intelligent systems can provide real-time performance feedback to students during Engineering tasks.

Results and Discussions

i. How does previous task performance feedback correlate to students’ current task performance?

**ANOVA TEST**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Feedback App</th>
<th>No Feedback App</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-per (Pass/Fail)</td>
<td>0.0725*</td>
<td>0.163</td>
</tr>
<tr>
<td>Obstacle (1-12)</td>
<td>&lt;0.001***</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>Participant (ID)</td>
<td>0.0198**</td>
<td>0.174</td>
</tr>
</tbody>
</table>

**Linear Regression Analysis**

\[
\text{Scale}(\text{IM}) = (1.4^{**}) + (0.03\text{Pass} + (-0.07)\text{No Feedback App + Obstacles})
\]

ii. How does students’ facial expression correlate to the performance feedback?

The following graphs illustrate the performance comparison tests and linear regression analysis for previous task performance feedback and students’ performance feedback.

Conclusions

The results indicate that real-time performance feedback might not be the optimal design for every student and/or task. They reveal that students’ performance on a task and their facial expression is correlated to the type of feedback provided in a previous task.

Future Works

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