How Spatial Perception Affects Pilots' Performance in Landing Tasks

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Introduction

Current applications of small unmanned aerial vehicles (sUAV)s range from military, first response, commercial and hobby uses.

Feasibility to start flying sUAVs encourages new pilots, however there is a current lack of standardization in flight licensure.

Next step in sUAV aviation is for developers and educators to comprehend a pilot's approach and understanding behind the controller.

It is important for sUAV users to not only be proficient in flying but how to recuperate the device when an autonomous flight does not function as planned.

Factors that could be a contributing element to flight and landing success:
- Spatial perception
- Environment of flight
- Short practice prior
- Familiarity with operating other machinery

Methods

21 Participants were observed in the Nebraska Intelligent MoBile Unmanned Systems (NIMBUS) lab located on campus

Participants were selected through the NIMBUS lab on campus, local drone companies, and other connections with researchers

sUAV used by participants was the DJI Flamewheel 450 in 'stabilize' mode

Most flights can be broken down to takeoff, hovering, and landing. Landing is specifically investigated for this project.
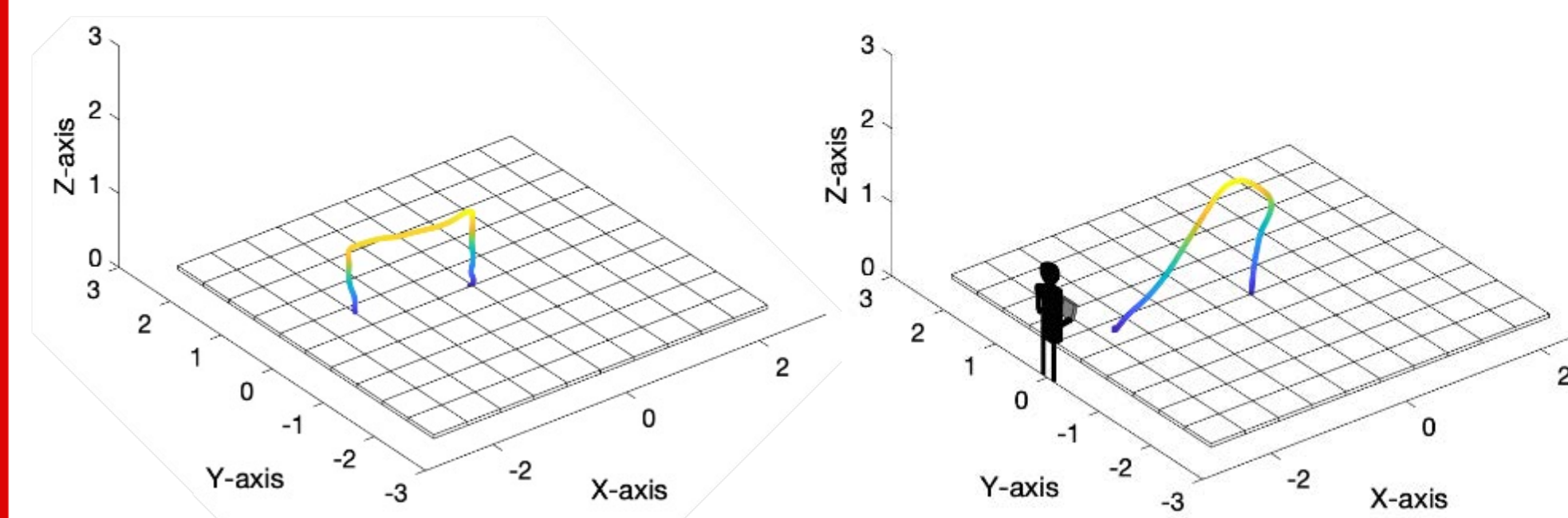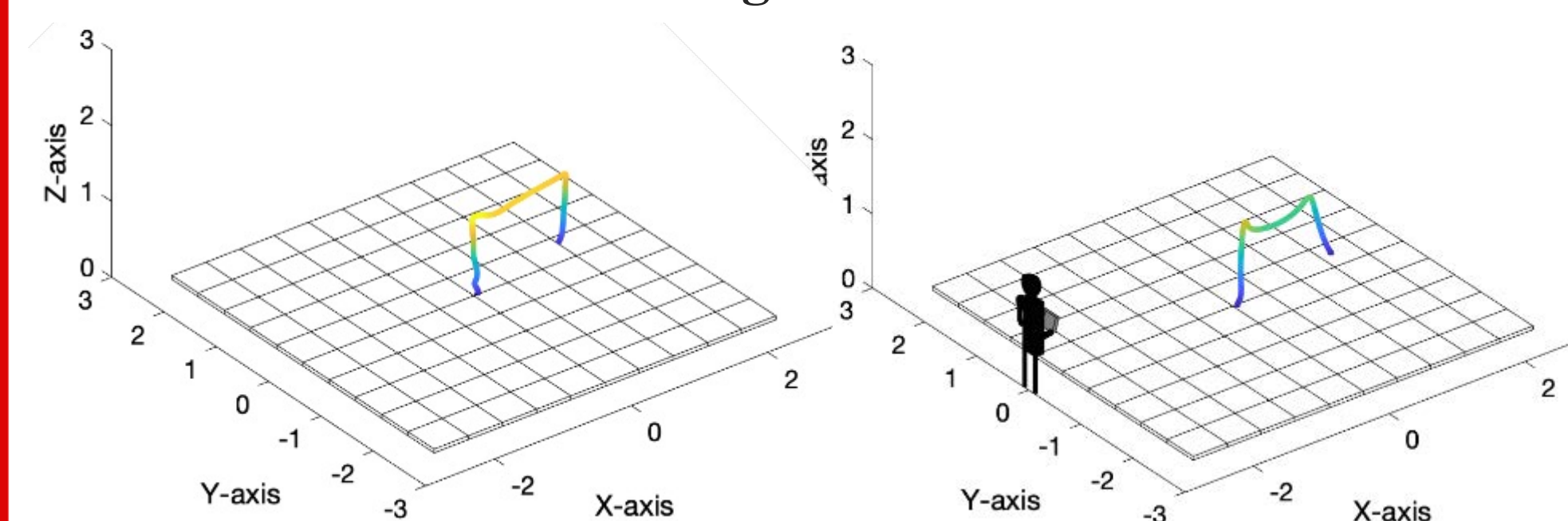
[2]
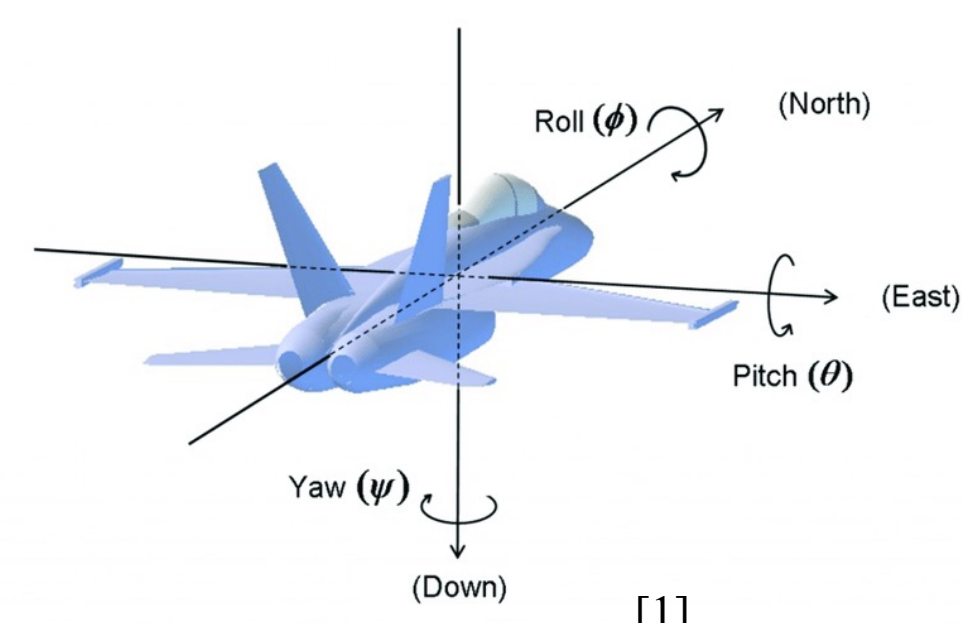
Other flight tasks completed by the participants involved the roll, pitch, and yaw elements to determine proficiency
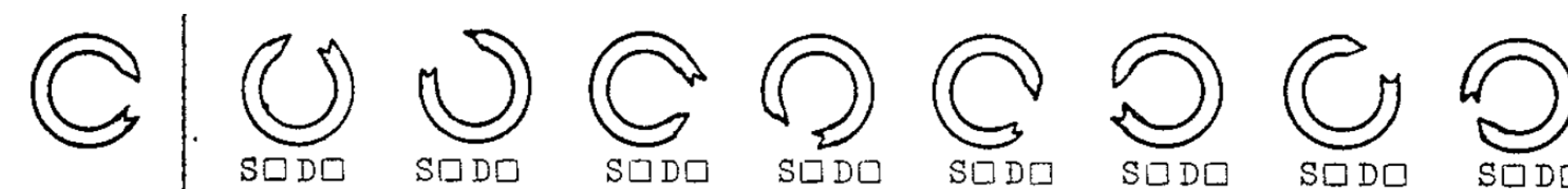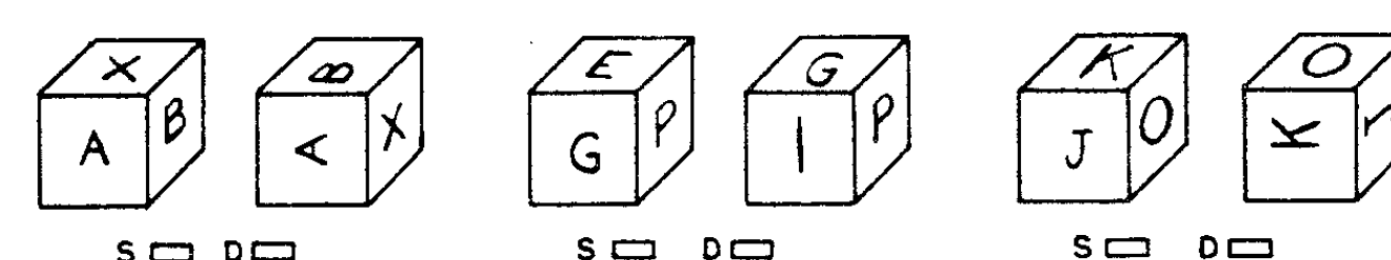
[1]

Sample Assessments

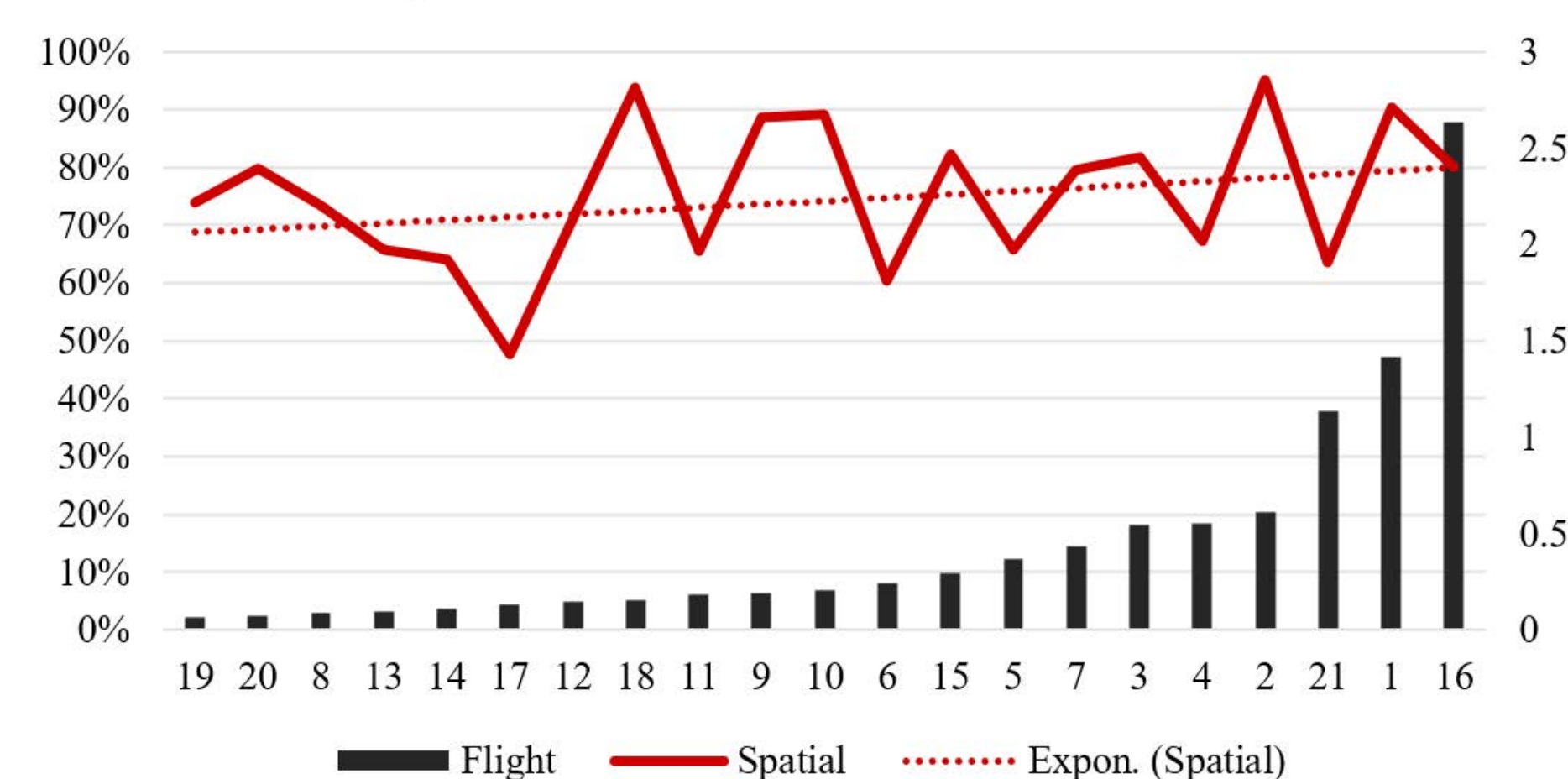### Flight Task 3

Flight Task 4

Card Rotation

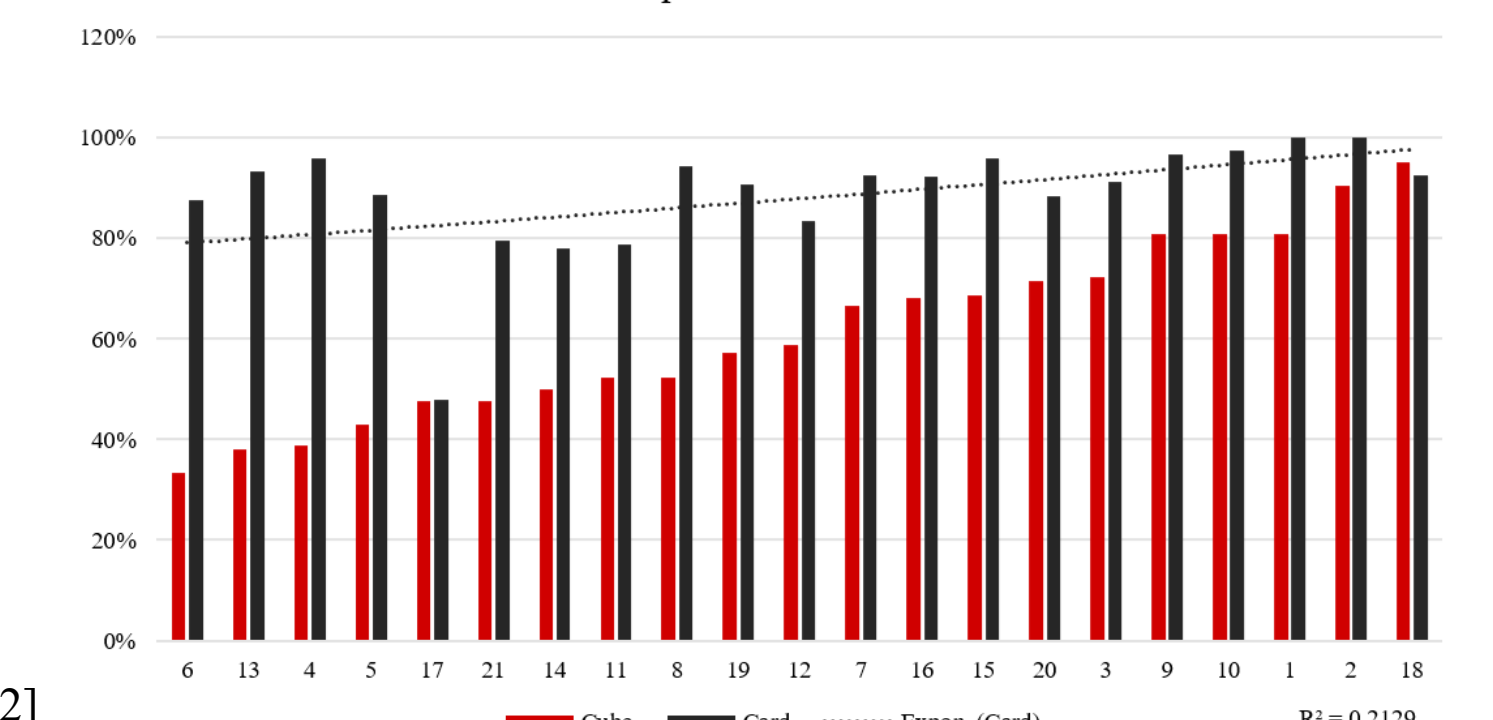### Cube Comparison

Comparison of Scores

R² = 0.0781

Flight   Spatial   Expon. (Spatial)

Results

T3 & T4 Flights

T3   T4   Expon. (T4)   R² = 0.6049
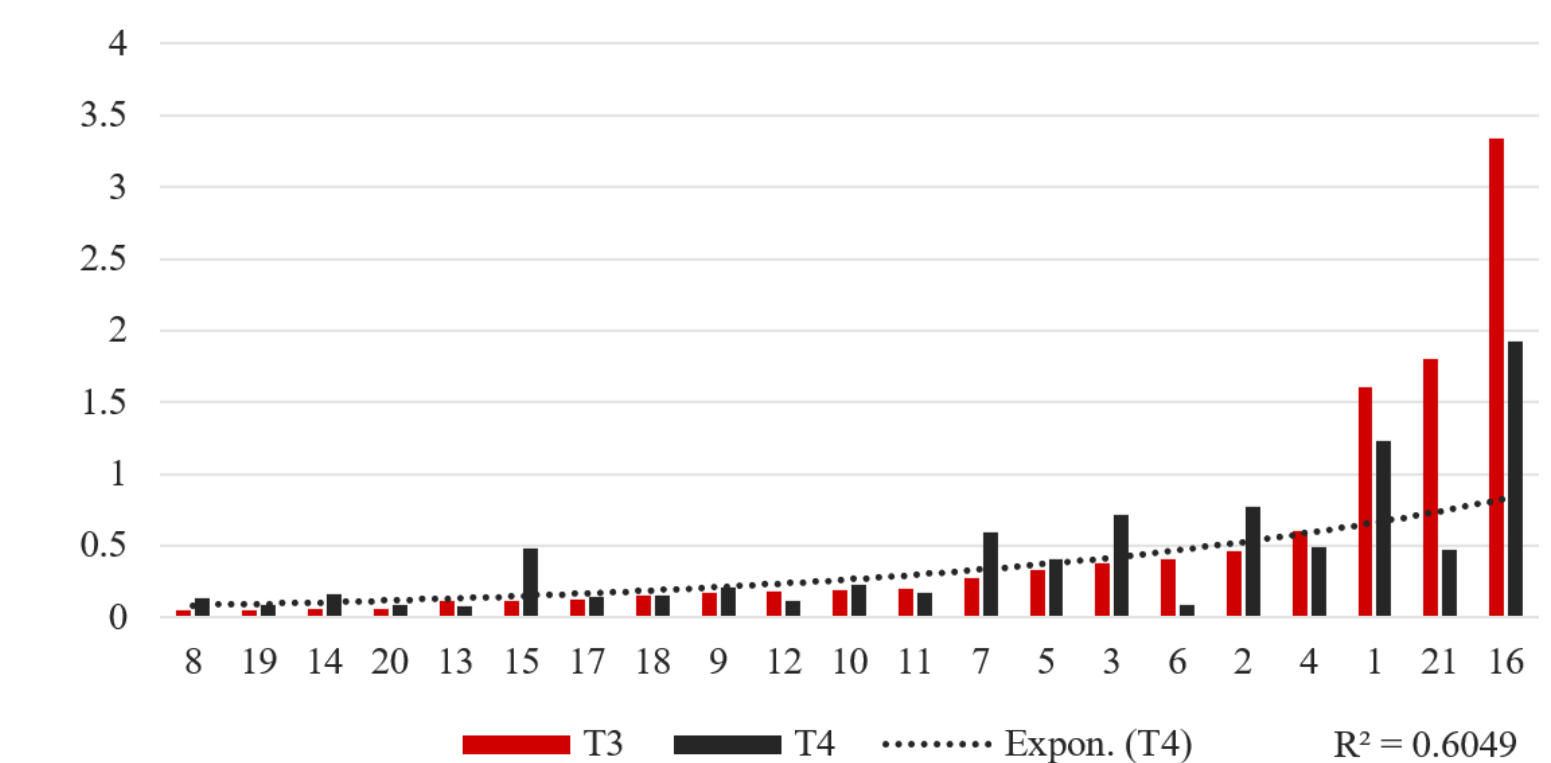
Cube Comparison & Card Rotation

[2]

Cube   Card   Expon. (Card)   R² = 0.2129

Discussion and Future Research

Results indicated that there isn't a strong correlation between spatial perception and the ability to land an sUAV successfully. A lack of correlation is predicted to come from the insignificance of spatial perception while controlling an sUAV.

Future research will be focused on other preliminary considerations impacting success flying and landing. Examples of this includes environment of flight, short practice time before flight, and the familiarity with control with other heavy machinery.

References

[1] A. Civita, S. Fiori, and G. Romani, "A Mobile Acquisition System and a Method for Hips Sway Fluency Assessment," *ResearchGate*, Dec. 12, 2018. https://www.researchgate.net/publication/329603549_A_Mobile_Acquisition_System_and_a_Method_for_Hips_Sway_Fluency_Assessment

[2] S. Kunde, E. Palmer, and B. Duncan, "Recognizing User Proficiency in Piloting Small Unmanned Aerial Vehicles (sUAV)," *IEEE Robotics and Automation Letters*, vol. 7, no. 2, pp. 2345–2352, Apr. 2022, doi: 10.1109/lra.2022.3142451.

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