

INTUITIVE

Visual Guidance and Interaction Design Communication Model for
Surgical Skills Training in Robotic Surgical Simulation

Mark Brosche, ME; Tansel Halic, Ph.D.; Hong-En Chen, Ph.D.; Tricia Gibo, Ph.D.; Henry Lin, Ph.D.
Intuitive Surgical Inc.

Introduction
Our objective is to develop standardized visual design and interaction framework for robotic surgery simulation in SimNow™ aiming at:

- Improving **task clarity and reduce ambiguity** in **self-training**
- Supporting **efficient robotic skill acquisition**

Methods
Our SimNow™ exercises were designed using our visual design communication framework with the following components (see Figure 1):

- Visualization & Design:** spatial references and instructional 2D/3D visuals
- Action States & Task Affordance:** instrument highlighting and motion cues
- Feedback & Warnings:** color changes, animations, and error indicators

Preliminary Results
A pilot evaluation was conducted using da Vinci Single Port (SP) simulation exercises with three expert robotic surgeons, each having performed several hundred to over a thousand multi-port robotic cases but no prior SP experience.

Preliminary results indicate that the visual design framework is **intuitive, consistent** and **achieves strong user satisfaction** (see Figure 2). Surgeons consistently recognized the educational and training value of visual elements in robotic skill acquisition and task understanding.

Conclusion
Standardized visual cues and feedback mechanisms support **task clarity, learner autonomy,** and promote **consistent skill acquisition.** These findings underscore the importance of cohesive visual communication systems in simulation-based surgical education.

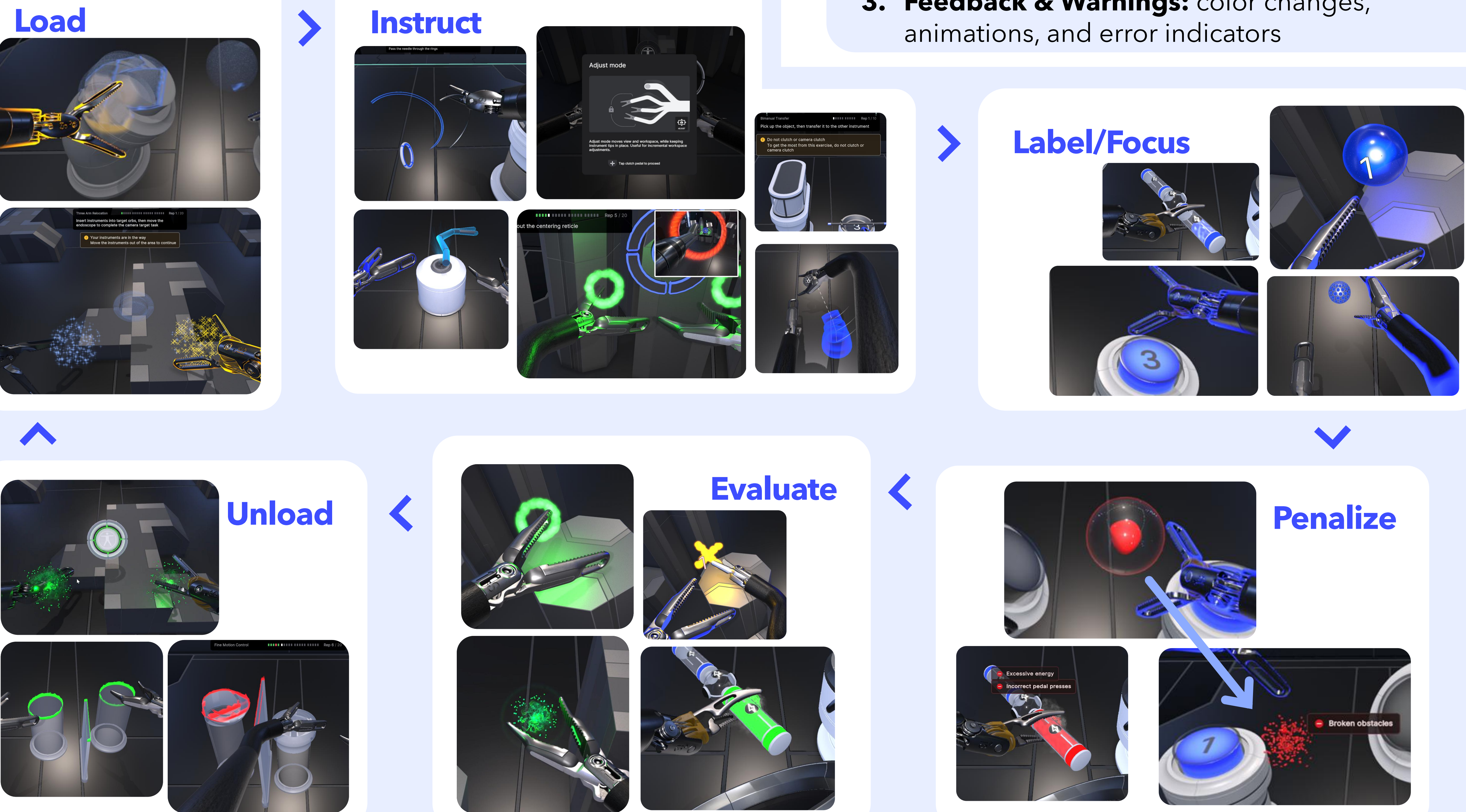


Figure 1. Model for visual guidance and interaction design communication

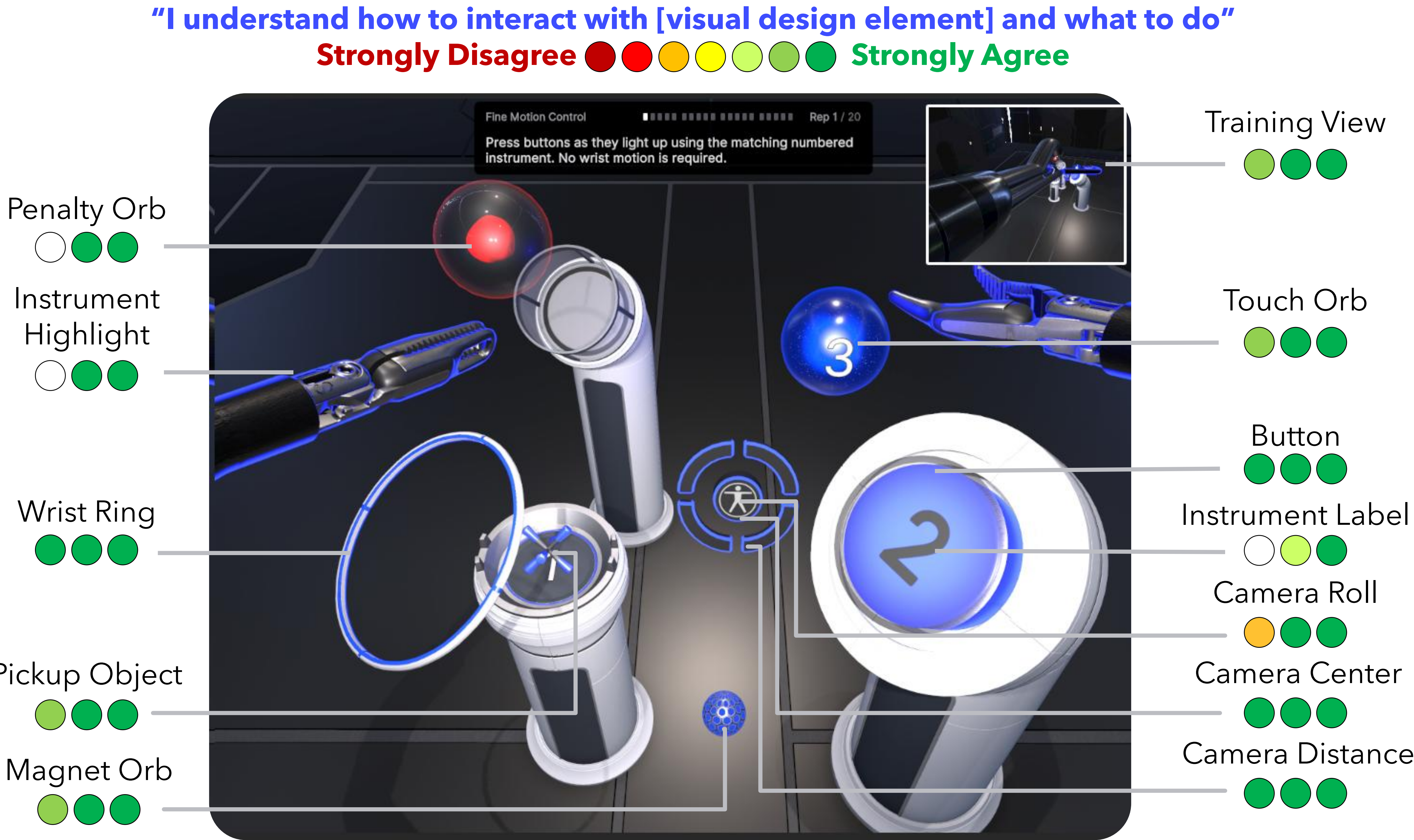


Figure 2. Preliminary results