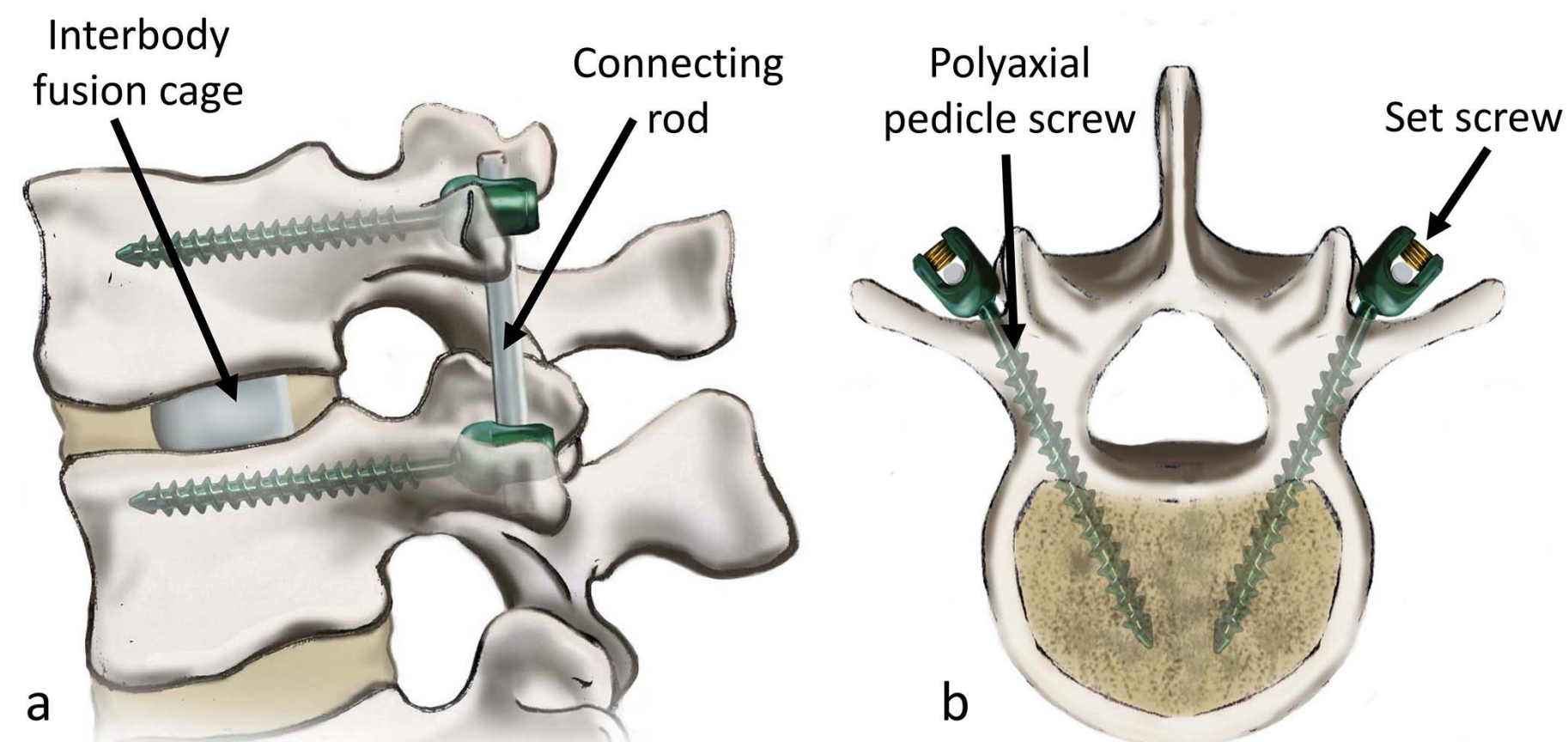


# Visual Attention Based Cognitive Human-Robot Collaboration for Pedicle Screw Placement in Robot-Assisted Orthopedic Surgery

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## I Motivation



**Pedicle Screw Placement:** Drill a hole on spine and insert a screw

### Current Robotic Solution

Navigation, use tube to guide tools

### Defects in HRI

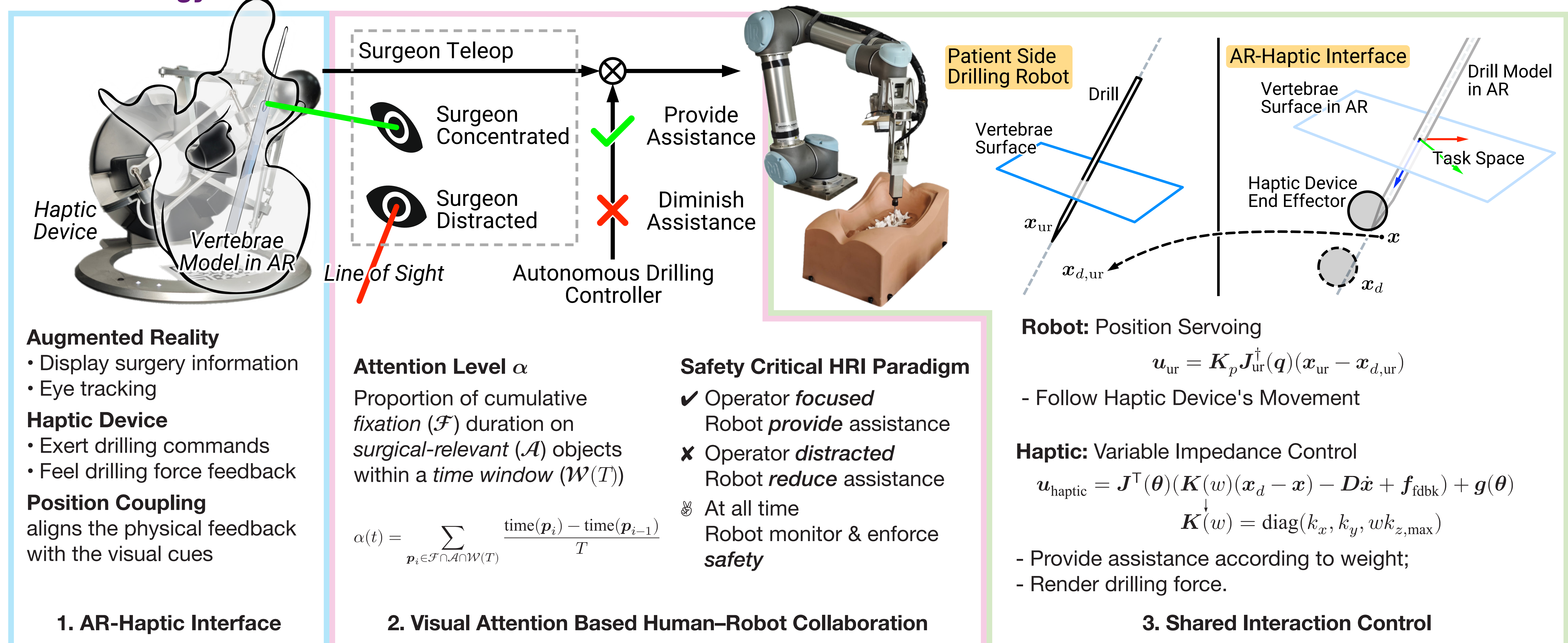
- Poor hand-eye coordination
- Require manual operation

### Goal

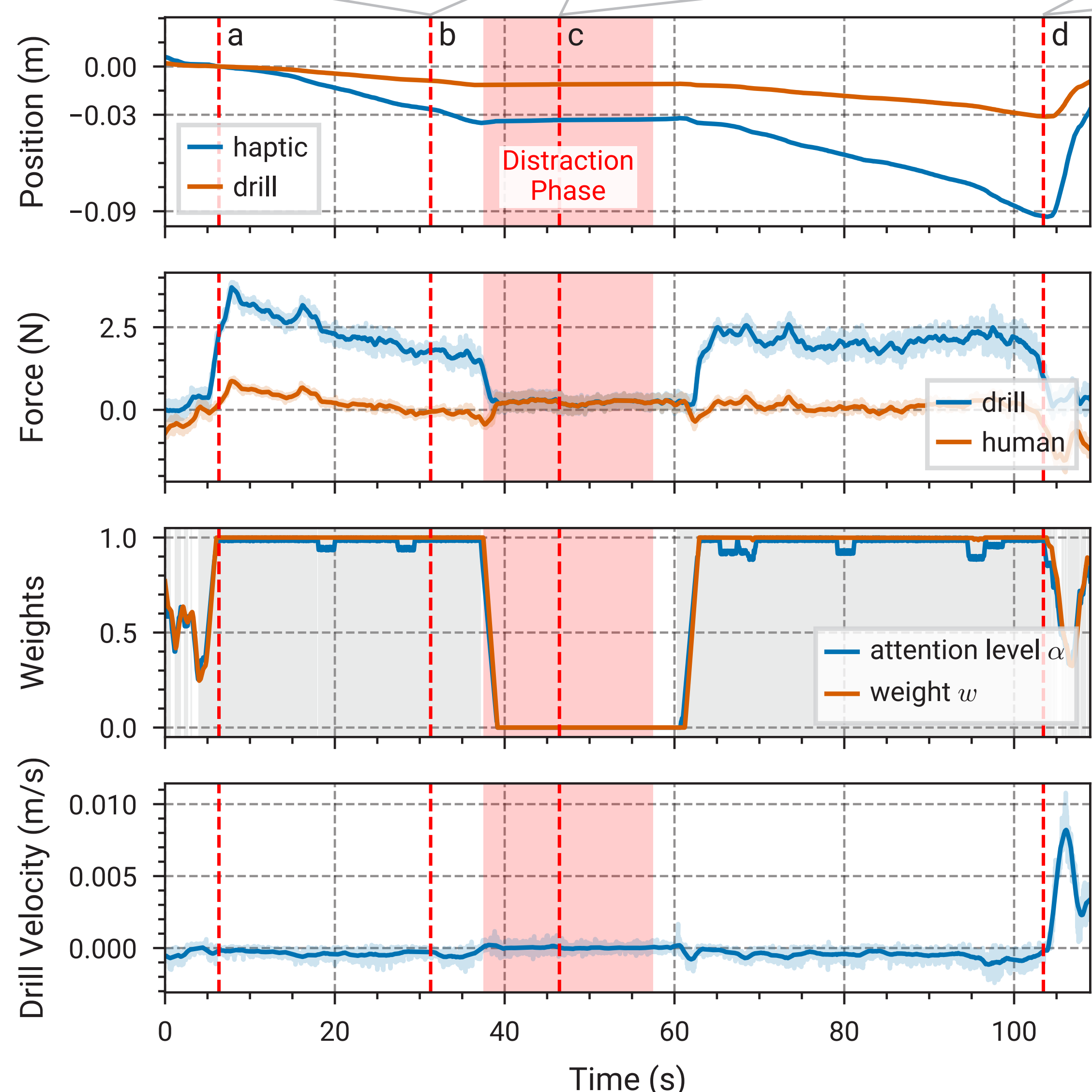
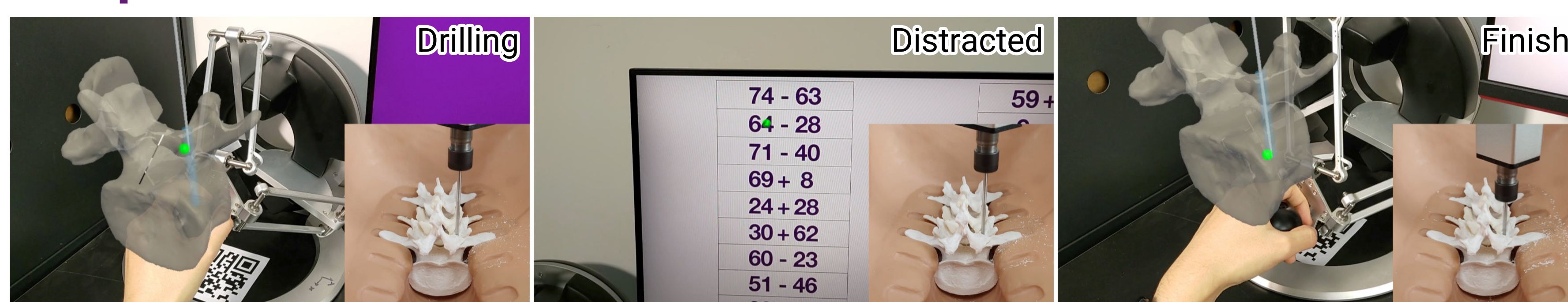
- Build a better HRI Interface
- Use gaze to ensure surgeon is always included in the control loop



## II Methodology

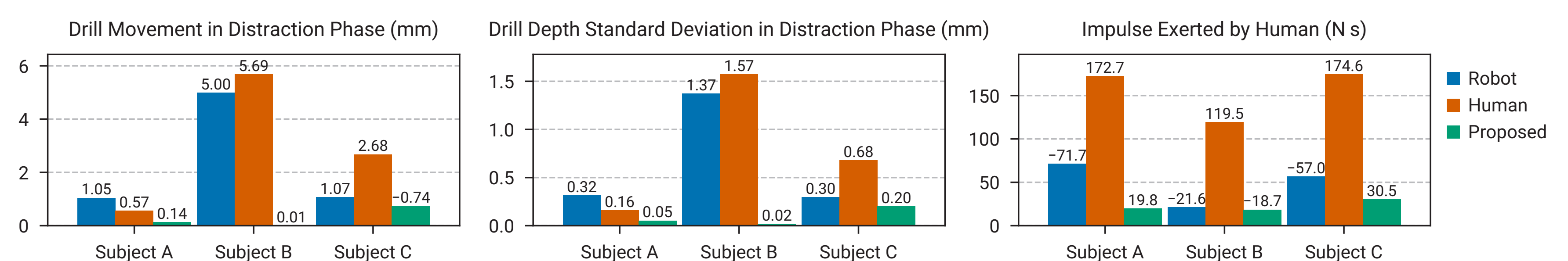


## III Experiment



**Task:** Drill a 30 mm hole, with a distraction phase to draw participants' attention

**Settings:**  $w=0$ ,  $w=1$ ,  $w=f(\alpha)$

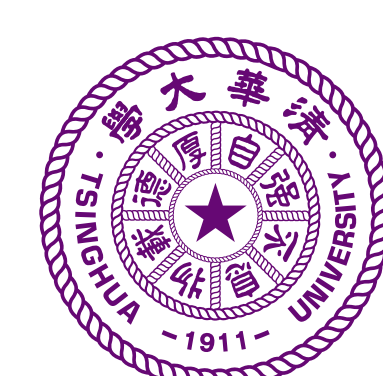


### Safety

Drill movements is unsafe when the surgeon is not in the loop.

### Ergonomics

Less exerted impulse leads to reduced work load.



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