Amplified Head Rotations for Low-cost Flight Simulators

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Research challenge

How to increase the utility of low-cost flight simulators to enable high quality, high performance *aircrew training* (Fig.1). This allows large-scale networked virtual training by reducing the risks, costs and constraints associated with real world flying and full mission simulators.

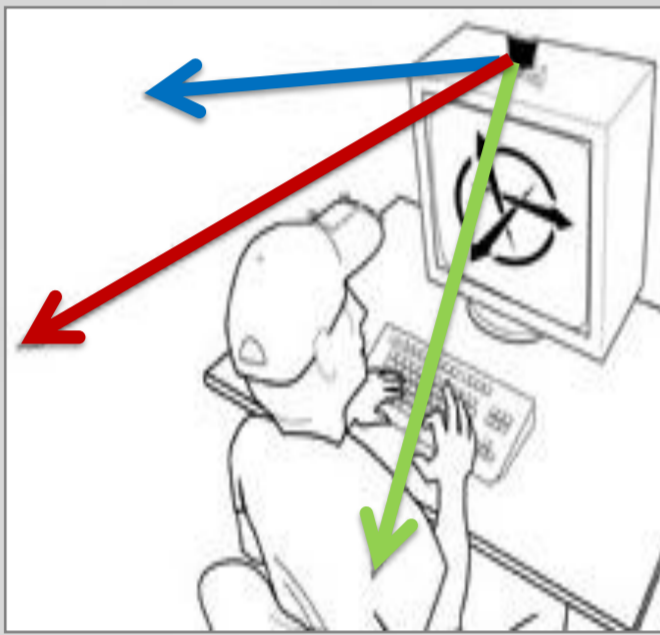Figure 1. Triple monitor fixed-base flight simulator

Figure 2. Mapping small physical head rotations to VR viewing while keeping display in sight

Figure 3. Passive infrared PC headtracker (i.e. TrackIR, Kinect, webcam)

Proposed solution

Amplified head rotations offers natural method to enhance VR viewing (FOV/FOR) limitations by:
- Non-unity/linear mapping between physical and virtual rotation (Fig.2)
- Exploiting visual dominance effect
- Using off-the-shelf head-tracker (Fig.3)

Research goals

- Find optimum gain parameters (Fig.4)
- Determine piloting performance improvement
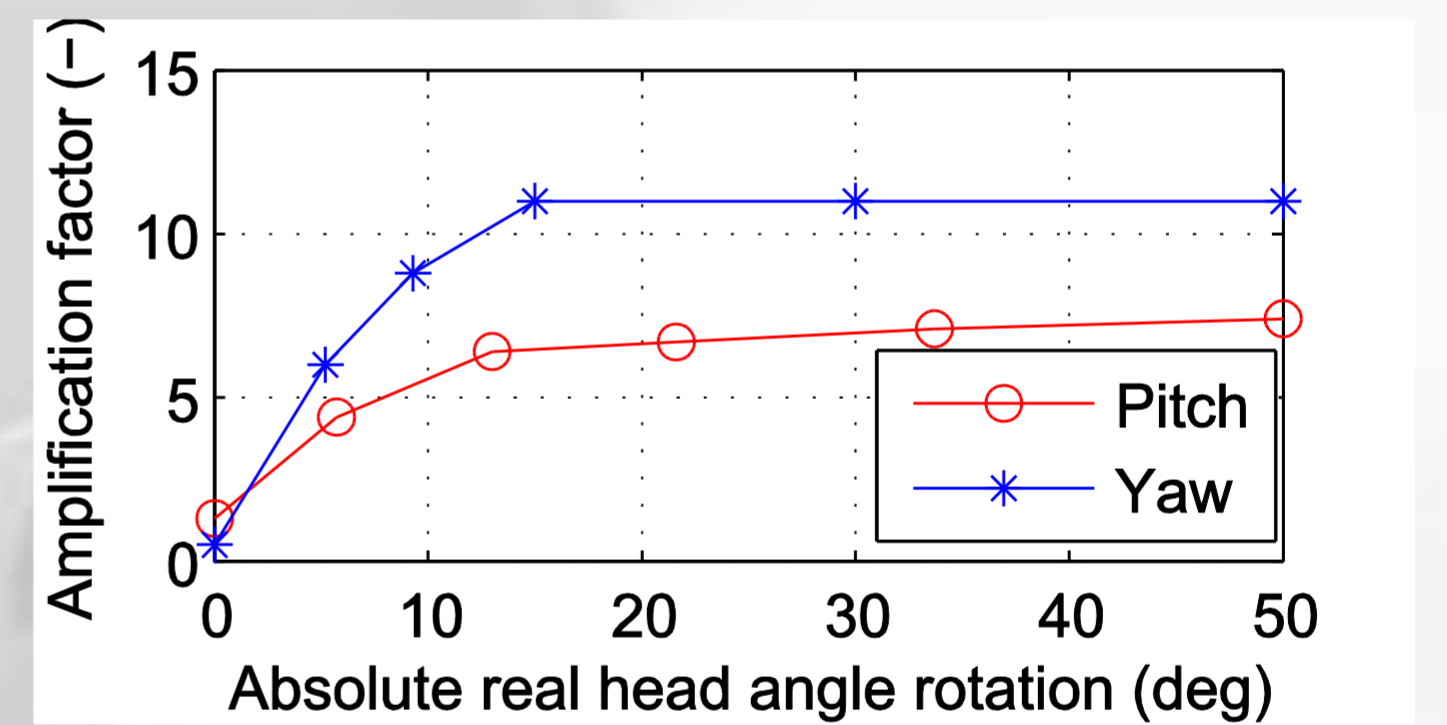- Quantify potential side-effects (workload and/or simulator sickness)

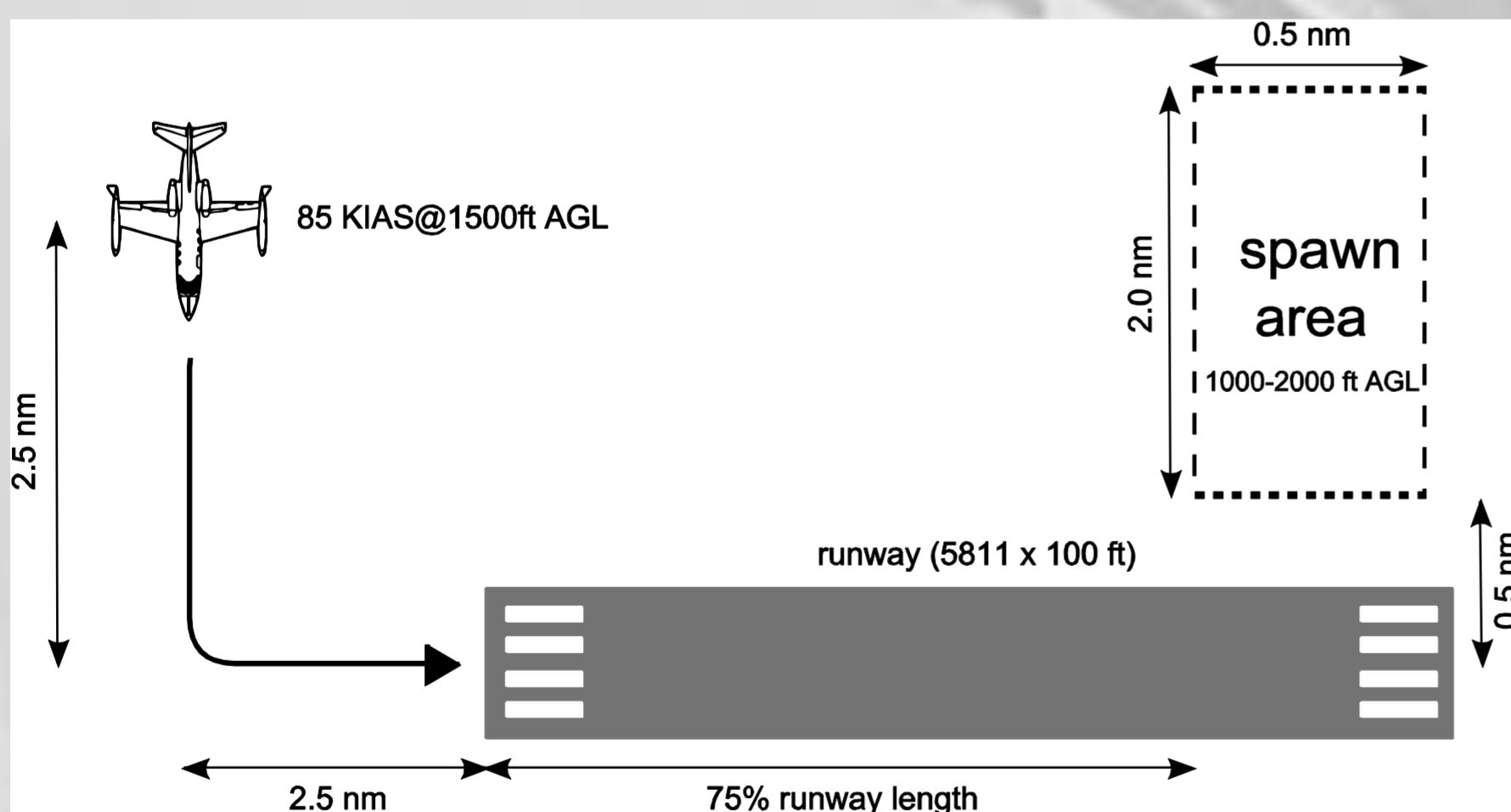Figure 4. Real head to virtual head mapping profile
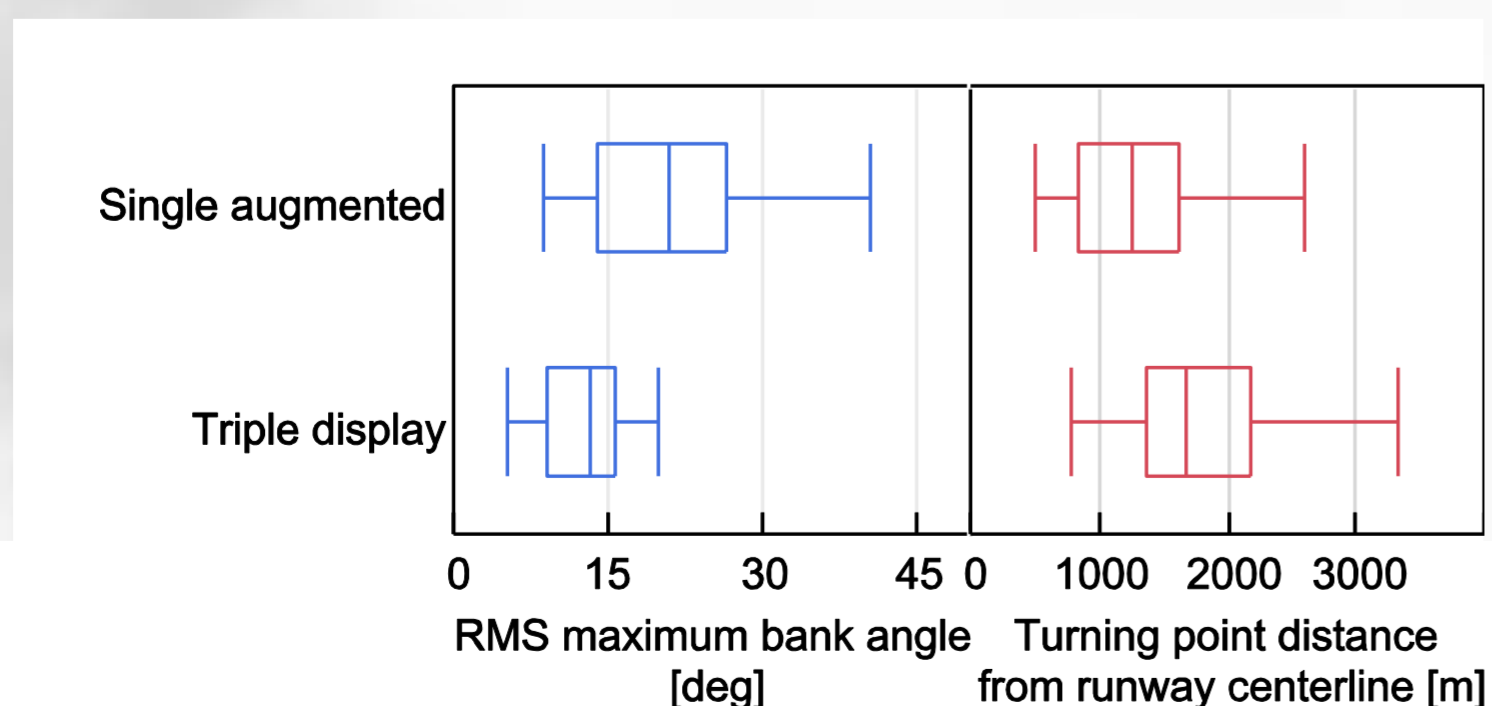

Figure 5. Downwind to final landing scenario

Figure 6. Flight technical error comparison

Human-in-the-loop Experiment

12 pilots, 2 displays
(<u>triple standard</u> vs. <u>single augmented</u>)
Primary task: fly visual circuit and land (Fig.5)
Secondary task: spot airborne traffic

Results

Visual flying now possible even on a single display! Ground track similar to real flying behaviour (Fig.6). Also promotes active scanning for traffic awareness

Future work

Larger displays, mapping tweaks + more complex flying tasks

Want to know more? Scan ✈
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