



Rubikon: Enabling Intelligent Tutoring of 3D Physical Tasks through User Modeling and On-Demand Augmented Reality

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OVERVIEW

Rubikon is an intelligent tutoring platform that enables adaptive, hands-on learning of 3D physical tasks using user modeling and on-demand augmented reality.

- **Core Features:** Real-time AR visualization of physical objects, personalized skill tracking, and automatic practice task generation.
- **Market Opportunity:** Rubikon's approach can transform physical skills training across education, workforce development, and hobbyist domains, with scalability to any skill requiring spatial reasoning or precise manipulation.

BACKGROUND

Learning complex 3D physical tasks—such as solving a Rubik's Cube, assembling objects, or playing musical instruments—demands both cognitive understanding and motor coordination. Traditionally, learners have relied on static text, videos, or generic AR tutorials, which often fail to provide hands-on engagement, real-time feedback, or adaptive practice based on individual needs. These methods suffer from poor alignment between real objects and tutorials, limited deliberate practice, and lack of customization, resulting in slow progress and frustration.

With increased interest in personalized, skills-based training—particularly in education, technical trades, and at-home learning—there is a growing demand for solutions that enable

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Software & Content

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Accessibility

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Accessibility

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learners to practice tasks repeatedly, receive immediate and focused feedback, and address specific skill gaps efficiently. The market is expanding due to trends in remote learning, rising adoption of AR/VR, and the need for scalable workforce upskilling.

INNOVATION

Rubikon combines camera-based AR tracking with intelligent user modeling to deliver a dynamic, interactive experience for physical task training. Here's how it works in simple terms:

- **Real-Time Object Tracking:** By attaching low-cost markers to physical objects (e.g., each square of a Rubik's Cube), a camera detects every movement and renders an interactive 3D model, including hidden sides, onto a screen.
- **Personalized Skill Mapping:** Rubikon analyzes user actions and progress, determining which concepts and motions are mastered or need improvement. A "skillometer" visually tracks individual proficiency for targeted feedback.
- **Adaptive Practice Generation:** Based on this analysis, Rubikon automatically generates new learning scenarios on the physical object—eliminating tedious manual reconfiguration—so users practice exactly where they need it most.
- **Immediate Feedback & Multi-Level Hints:** The system compares each user action against expert models in real time and provides just-in-time coaching, from simple cues to stepwise tips, empowering learners to correct mistakes and build expertise faster.

These capabilities set Rubikon apart: rather than simply showing how to do a task, the system adapts continually to each learner, actively guiding them through personalized practice until mastery is achieved. Its architecture can be generalized to any scenario involving 3D objects—making it transformative not just for puzzles and assembly, but for musical training, art, lab work, and beyond.

ADDITIONAL INFORMATION

REFERENCES:

["Rubikon: Enabling Intelligent Tutoring of 3D Physical Tasks through User Modeling and On-Demand Augmented Reality"](#)