

NATIONAL SCIENCE FOUNDATION
Proposal Abstract

Proposal:1937036

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Proposal Title: Convergence Accelerator Phase I (RAISE): Skill-LeARn: Affordable Augmented Reality Platform for Scaling Up Manufacturing Workforce, Skilling, a
Institution: Purdue University
Abstract Date: 07/29/19

The NSF Convergence Accelerator supports team-based, multidisciplinary efforts that address challenges of national importance and show potential for deliverables in the near future.

The broader impact/ potential benefit of this Convergence Accelerator Phase I project will be immediately applicable to the manufacturing sector, which has a multiplier effect on the economy and jobs. Automation is splitting the American labor force into two worlds: a relatively small number of highly educated professionals earning good wages, and less-educated workers who are left with businesses that pay low wages. Although we have had technology breakthroughs, the overall productivity growth is slow partly due to a workforce that lacks critical new competencies, such as procedural instruction learning, digital fluency, and other essential skills. The current and future workforce needs to be geared up for a culture of constant change. Companies have been relying on the age-old way of one-on-one Worker Apprenticeship model to train their new workforce. However, the recent need for larger scale and rapid training has created a bottleneck in terms of time and cost, especially for small and medium enterprises (SMEs). This research team comprising of mechanical and electrical engineers, psychologists, computer scientists, and education researchers will work toward accomplishing a goal of creating a scalable low-cost solution for (re)skilling the workforce.

In order to address this (re)skilling challenge, we propose to emulate the worker apprenticeship and develop a new low-cost and flexible way for SMEs themselves to author in Augmented Reality (AR). By overlaying digital content over the physical world we will address issues of worker training that SMEs continue to face. We plan to break down the problem of worker (re)skilling into three categories: Authoring: knowledge transfer, Training-Learning: system scaling for consumption, and Feedback: providing active feedback to users. AR has shown to be a reliable mode of instructional training, improving speed and reliability, minimizing errors, and reducing the cognitive load of the user, especially for spatially situated instructions. SMEs are often unaware, reluctant, and lack access because of the high overhead costs, unknown returns, and lack of expertise involved in designing, creating, and maintaining the AR content for the success of this technology. We propose to develop technologies which enable experts in the SMEs to create content on their own and provide a smooth transfer of knowledge. The ease of creation of AR, and elimination of dependency on programming experts, will translate to a reduction in AR development time and cost.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.