Canadian Journal of Undergraduate Research: Abstract Template

Design and Testing of an Augmented Reality-Assisted Vein Detection Device: A Low-Cost Solution for Difficult Intravenous Access in Healthcare Settings

Theme – Biomedical devices, Medicine, Computer science, Biomedical Engineering, Nursing

Type of project: Research

Nicole Merritt[1], Kibele Sebnem Yildirim[2], Vanessa Lo[1], Rohith Kristhnamurthy[3], Charlene Ronquillo[1]*, Abbas S. Milani[3]*

[1]: School of Nursing, The University of British Columbia, Kelowna, BC, Canada, V1V 1V7

[2]: Department of Computer Science, The University of British Columbia, Kelowna, BC, Canada, V1V 1V7

[3]: School of Engineering, The University of British Columbia, Kelowna, BC, Canada, V1V 1V7

Student authors: nicolemerritt@live.ca, sebnemkibeleyildirim@gmail.com, vanvan6518@gmail.com, rohith.jk@ubc.ca

Corresponding (faculty) authors: charlene.ronquillo@ubc.ca; abbas.milani@ubc.ca

---

Difficult intravenous access (DIVA) is a prevalent healthcare issue that is currently leading to repeated insertion attempts by healthcare staff that may be (1) uncomfortable and stressful for patients, 2) frustrating and time consuming for healthcare professionals, and 3) promoting unnecessary waste of single use medical supplies. Correct establishment of patient vein access is essential for maintaining fluid and electrolyte balance, administering critical medications, and preparing for subsequent potential medical imaging and surgeries, intravenously. Unfortunately, existing vein-finding technologies face heavy user and technological limitations, and are prohibitively costly. In this research, we conducted a detailed literature review on current vein-finding applications, and accordingly developed an innovative hands-free augmented reality (AR)-based system that can support healthcare professionals' ability to establish intravenous access in difficult cases. The proposed low-cost solution is backed by a machine learning (ML) architecture which improves vein detection efficiency through computer vision and IR depth detection technology, which maps the depth of the vein during the scanning. In the next step of the research, the ML model will be informed by a wide collection of patient image data, which will be collected in various Canadian Blood Services donation clinics. The complete ML tool will be eventually integrated into a smart glass or a head-mounted display (ie. Microsoft Hololens) to be a wearable design.

Canadian Journal of Undergraduate Research: Abstract Template

Keywords: Difficult intravenous access, augmented reality, machine learning integration, user-centered design