

SOLDAR

SUPPORTING LOW-VOLUME PCB PROTOTYPING USING COLLABORATIVE ROBOTS AND AUGMENTED REALITY

Xander Vaes • Dries Cardinaels • Mannu Lambrichts • Raf Ramakers

UHASSELT EDM FLANDERS MAKE

We introduce **SOLDAR**, a system that facilitates the soldering of electronic through-hole components on PCBs. By using a cobot for optimal positioning of a PCB and AR glasses for step-by-step guidance, SOLDAR aims to streamline the positioning and soldering of components. SOLDAR aims to increase efficiency, reduced assembly time, and greater flexibility for low-volume PCB prototyping designs.

PROBLEM STATEMENT

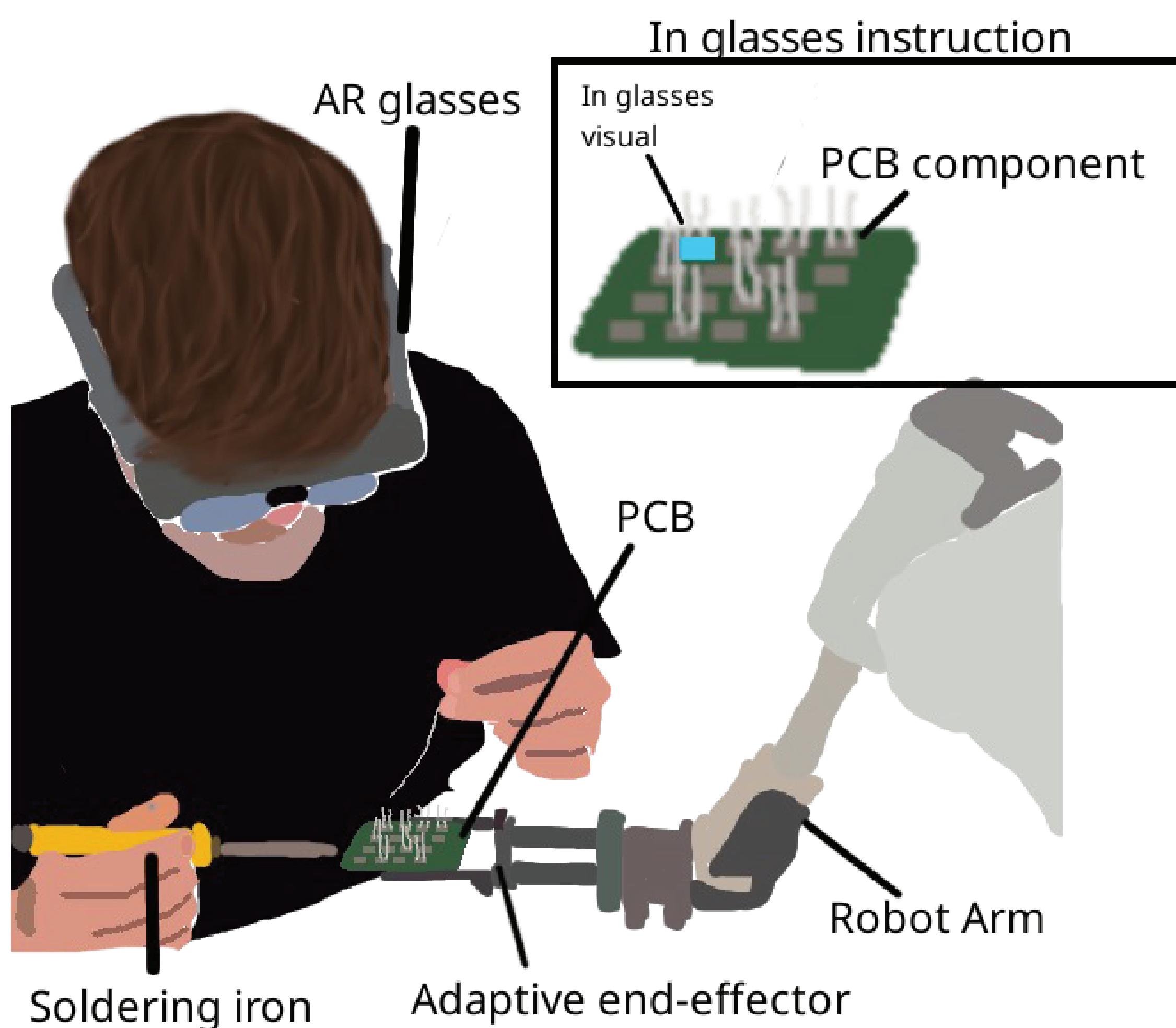
PCB assembly for low-volume prototyping is challenging as it requires precise positioning of components as well as manual soldering. Automated systems like pick-and-place robots and cobots, though efficient, require complex setup and are costly, making them unsuitable for rapid prototyping and small-scale projects. As a result, many engineers and DIY enthusiasts turn to manual soldering. However, the lack of a "third hand", often results in misalignment of components, poor soldering joints, slow processes, and errors.

OUR SOLUTION

- Utilizing a cobot as a "third hand" to assist in soldering by precisely positioning the PCB in an ergonomic orientation, allowing the user to solder with greater comfort and efficiency.
- Perform soldering iron collision calculations to determine the optimal soldering angle for each component, based on the provided component position data.
- Use AR to provide real-time, step-by-step assembly and soldering instructions, guiding the user through each stage of the soldering process.

IMPLEMENTATION

- Calculate the optimal solder angle, and accompanying AR instructions, starting from the locations of components on a PCB.
- AR Assembly instructions, shown on the PCB, next to a canvas showing the component value, identifier, and corresponding color.
- AR Soldering Instructions which guides the user by highlighting the component that needs to be soldered next, ensuring that the PCB is positioned at the optimal angle for soldering the component.



CONCLUSION

- SOLDAR revealed challenges in PCB prototyping, including inaccuracies in component positioning due to data conversion and tracking errors, and board shifting caused by the PCB rotation mechanism.
- Display limitations, particularly the Magic Leap 2's 25 cm close-up boundary, impaired user feedback and precision soldering.
- While SOLDAR shows promise in using cobots and AR for low-volume PCB prototyping, improvements in tracking accuracy, calibration, and further user testing are necessary to enhance its effectiveness.

