

# Autonomous Welding Robot

## Background

### Problem statement

The Autonomous Welding Robot project is an innovative endeavor to design and develop a user-friendly, safe, and efficient robotic solution for performing precise and repetitive welding tasks, aimed at enhancing accessibility in educational and research environments, and optimized for cost-effectiveness and operational simplicity.

### Constraints

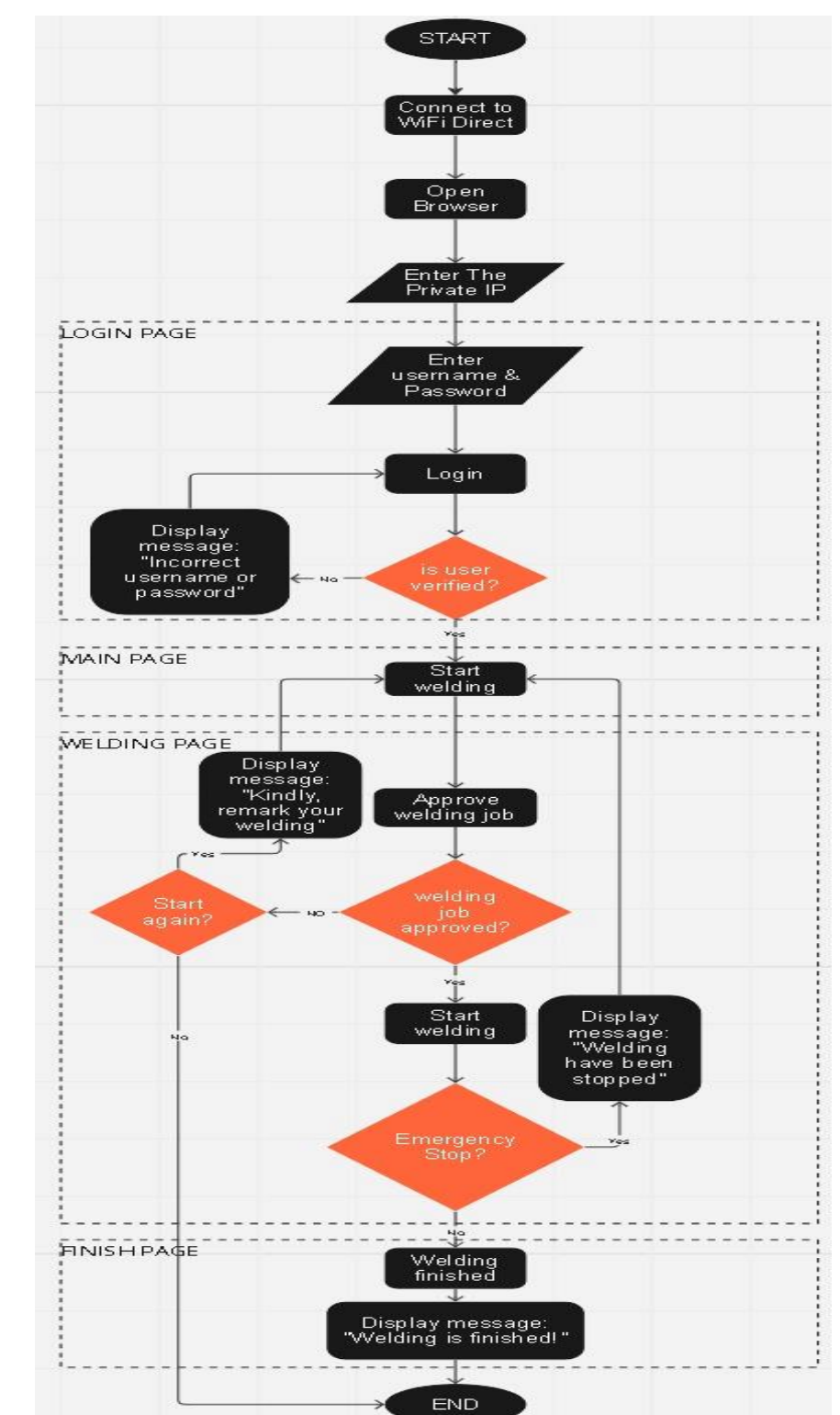
- Budget: 6000 SR
- Time: 4 months
- Safety
- Welding Object Size

## Target Specifications

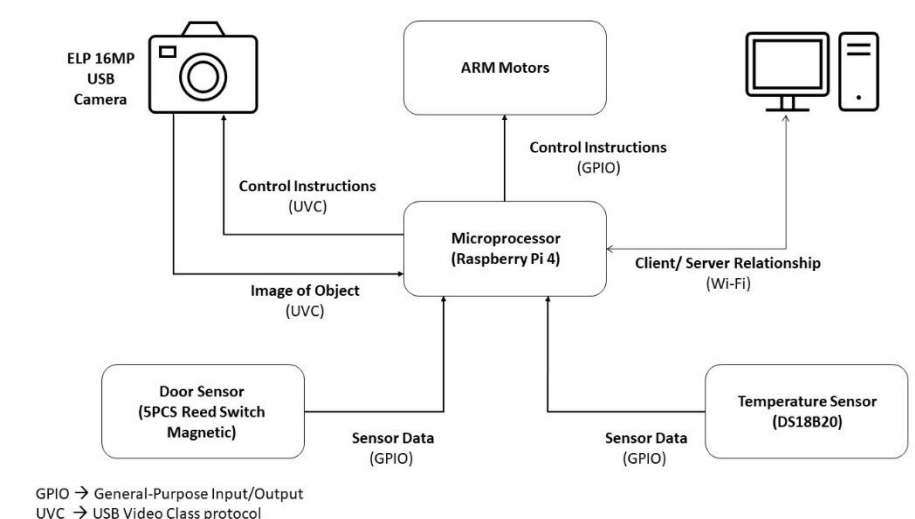
- The dimensions of the welding area should be  $(0.3 \times 0.3) \text{ m}^2$
- The maximum reach of the arm is more than 38.55m.
- Accuracy: The precision of reaching the welding location is less than 2% in mm.
- Type of welding: Metal Inert Gas (MIG)
- Set-up Time should be less than (180 Sec)
- Protection system: Isolation system for both heat and gases:
- Prevent any electrical shocks (# of shocks = 0)
- Minimize the gas leaks: ventilation system( $\text{m}^3/\text{h}$ )
- The capability of the action area to resist heat, up to (1773.15 K)
- The capability of the arm head robot to resist the heat (573.15K)
- Sensors efficiency more than (99.5%)

## Prototype Design

### Software Flowchart



### Hardware Design



## Validation

- We measure it, it is  $0.3 \times 0.3 \text{ m}^2$
- We did the Pythagorean theorem and added allowance space. And we measure it.
- By reducing the speed of motors and increase the gears ratio, to increase the accuracy of each motors. By this, we can grantee that the maximum error will be less than 1 cm.
- We prepared a suitable setup for the MIG welding machine.
- We simplify the process and minimize the number of steps by comparing it with similar projects.
- We fully isolate the welding area with non-conductive material.
- We designed the box to contain a ventilation system.
- We choose steel. Which has a melting point of 1478.15-1643.15 K
- We choose the proper type of material.
- From datasheet

## Conclusion

Our project introduces a new, easy-to-use welding robot, making welding safer and more efficient. It's a big step in using robots for practical tasks, and it shows how technology can make complex work simpler and safer, especially for beginners in welding and robotics.



Kumail Alhuwayji  
Computer Engineering  
Department



Abdulaziz Alluhayb  
Computer Engineering  
Department



Rayan Asiri  
Control & Instrumentation  
Engineering Department



Ridha Alamer  
Industrial & System  
Engineering Department



Rawad Alhujily  
Industrial & System  
Engineering Department