ESP-32 A Break Through in Vein Visualization Technology

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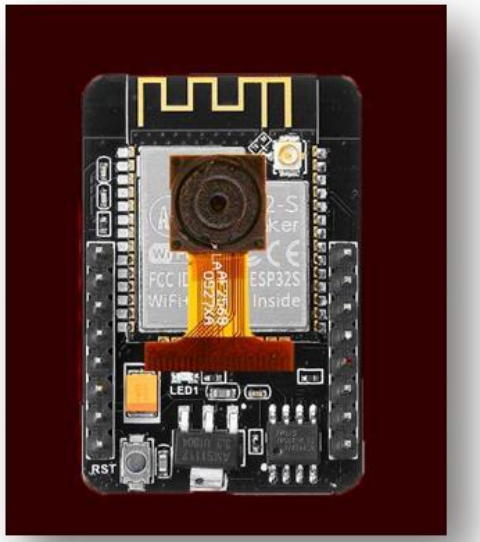
Introduction

Vein detectors or visualizations are medical devices that help locate veins in the body from the surface of the skin.

Components:

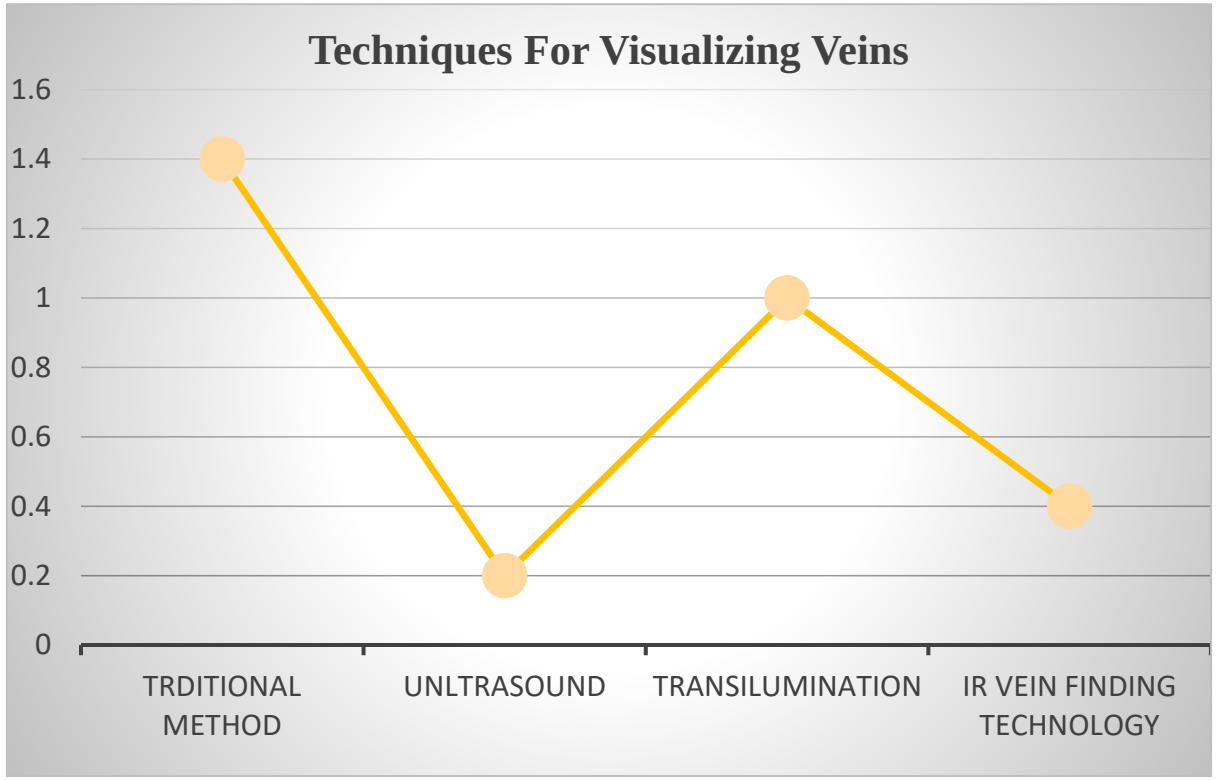
- Red SMD LEDs
- ESP 32 Camera Module



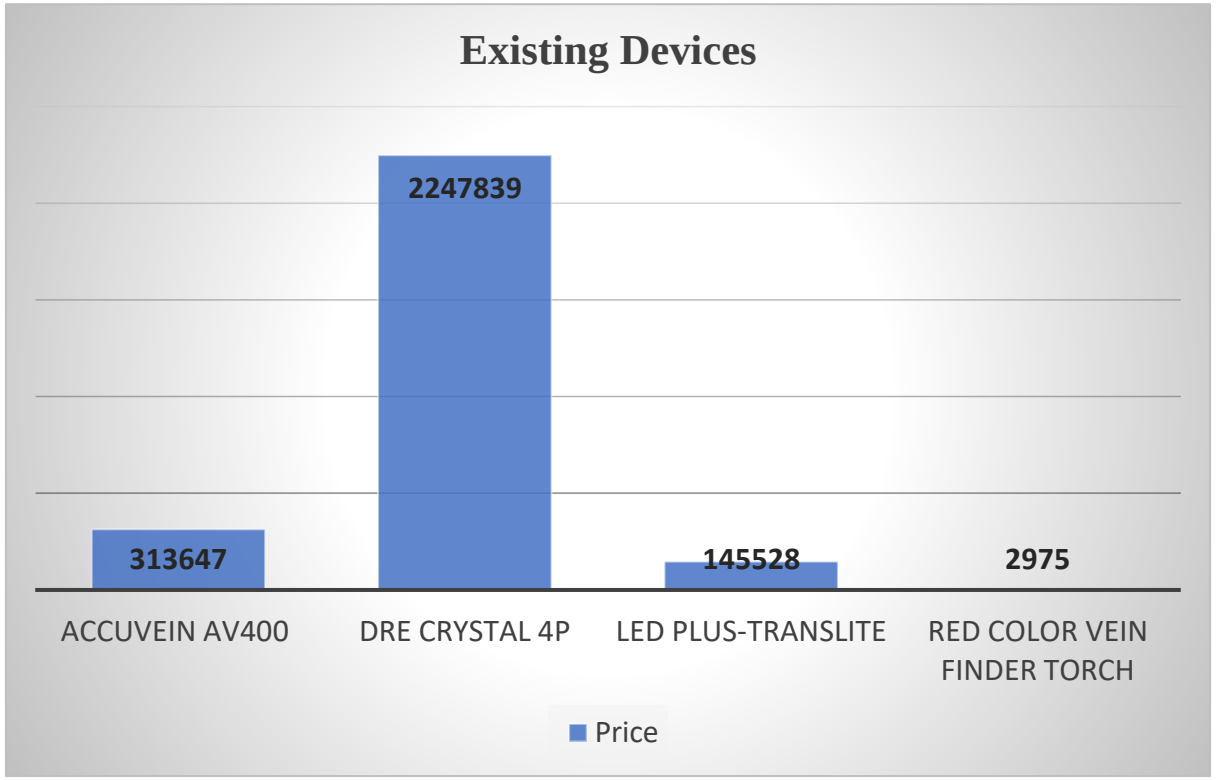
Problem Statement:

- Some techniques are costly but offer high accuracy, Conversely, low-budget techniques often sacrifice accuracy. Balancing budget constraints with the need for reliable results is challenging.
- Side effects of already acquired techniques.

Literature Review:



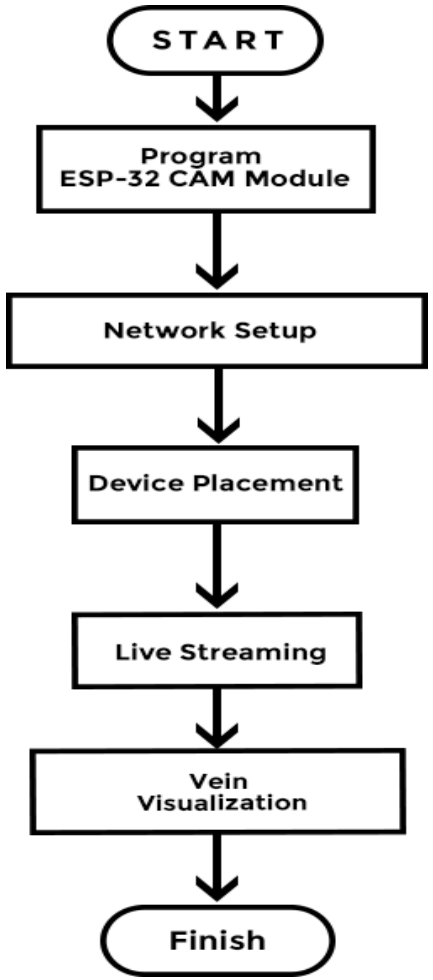
Comparison of Various Techniques for Vein Visualization in the Medical Sector



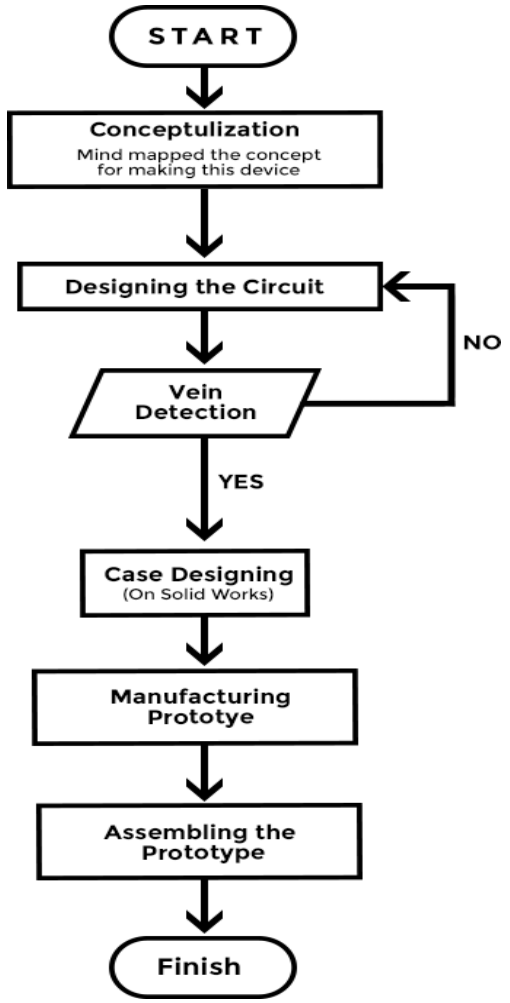
Price Comparison of Vein Visualization Devices Used in the Medical Sector

Methodology:

- A flow-chart explaining the process of vein Visualization



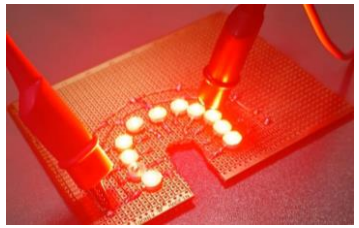
- Product Designing and Prototype Manufacturing

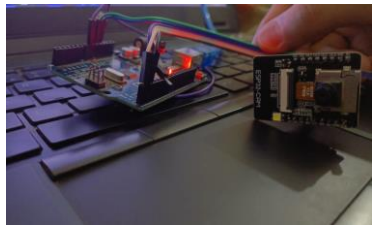


Working Principle:

- The fundamental principle of a vein detector is the absorbance of red light by hemoglobin resulting in the manifestation of dark lines on the surface of skin.
- The red light is projected onto the viewing area and is absorbed at the locations where blood (veins) reside.
- To create a digital image we programmed a camera and modified it using a negative filter. This allows us to illuminate the veins in the digital image. So we can easily visualize veins on the Skin's surface on the laptop.

Methodology (continued):





Vero board circuit of SMD lights parallel circuit

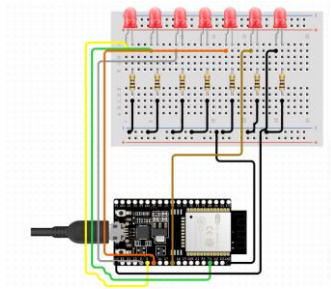
Circuit designed on circuit.io

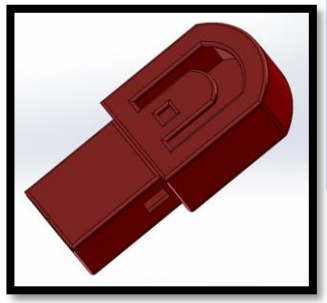
Simulation picture of Electronic Circuit

CAD Model Designing

CAD Model Printing

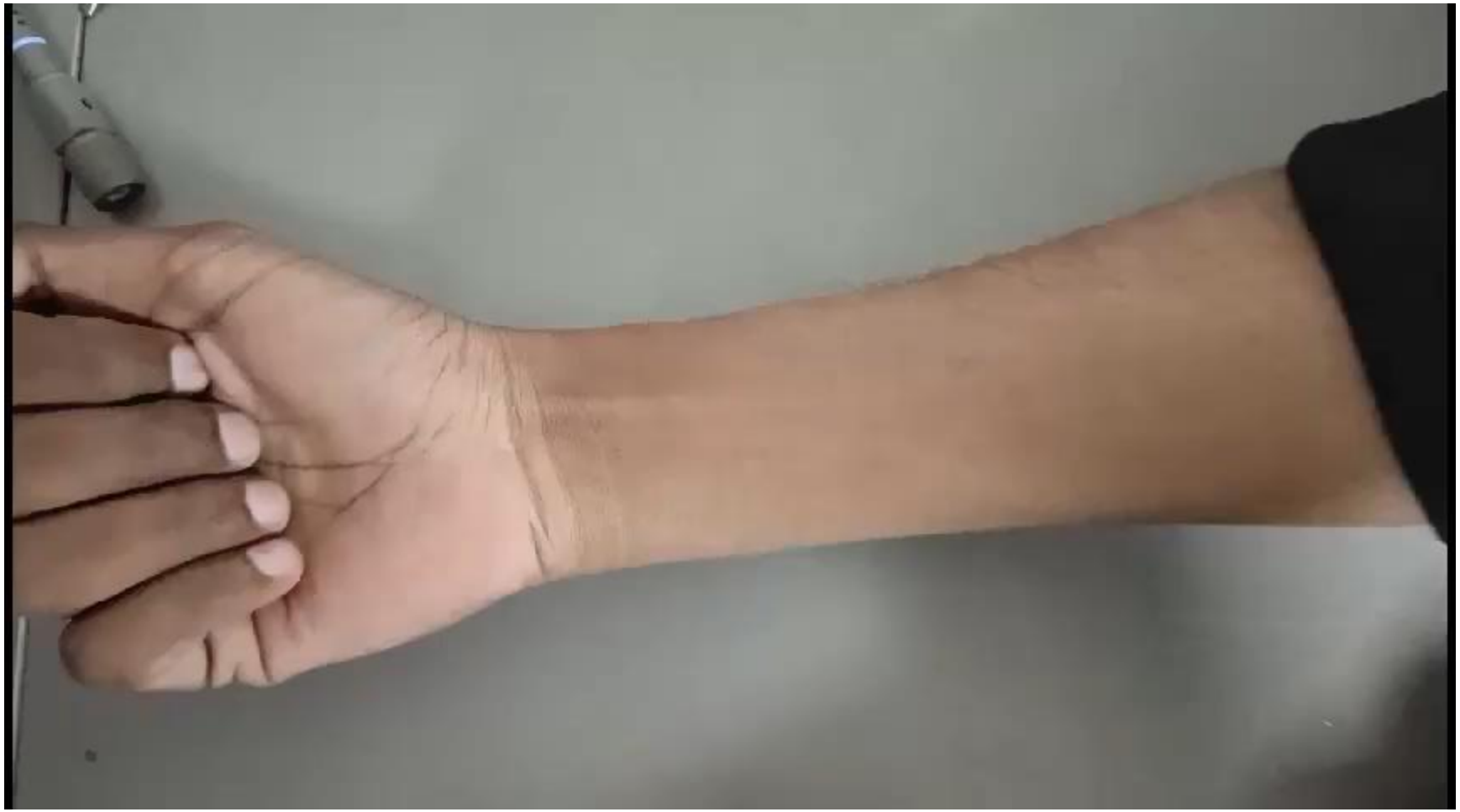
Final Product





Picture of Prototype of device

Working Video of Device:



Result from the Video:

Picture of veins from the forearm

- Diverse subjects, various skin tones.
- Effective vein detection, irrespective of skin color.
- Clear display of vein visibility.
- Stable red light penetration across lighting changes.
- Result include subject with darker skin tone.

Conclusion:

- Overcomes challenges of traditional methods; cost-effective and efficient.
- Effective across diverse skin tones and age groups.
- Success in research, device design, and manufacturing.
- Practical tool for healthcare professionals.
- Accurate vein localization using hemoglobin's absorption properties.
- Negative filter enhances visibility.
- Dependable in various situations.
- Potential for widespread use, especially in emergencies and outpatient settings.

Future Work:

- Visualizing veins on a screen that is attached to the device rather than on another device.
- Visualizing veins on the surface of the skin instead of on a device screen.

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