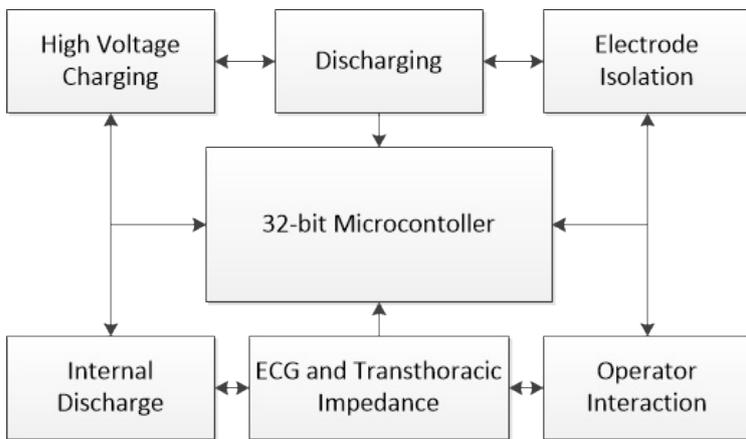


Automatic External Defibrillator

Sosaley's AED is a fully automated device. The ECG acquisition, impedance calculation, and shock delivery are executed automatically. The operator has to just switch the unit on, listen to oral instructions and place the electrodes appropriately. The device comes with printed, oral and video instructions that have been tested on untrained people. The unit identifies the language from its own GPS location, and the language choice can be switched rapidly.

The Sosaley AED is built in a modular fashion with sections, each of which executes a particular function. This modularity makes it easy to debug and add features.



High Voltage Charging Section

The high voltage charging circuit consists of a Flyback transformer that can charge the DC capacitor with up to 1500 volts and 200 Joules in under 15 seconds. Sosaley did a huge amount of R&D and looked at special transformers and capacitors that can fit on a small PCB, have no EMI, and is completely isolated from the other circuits.

Ultimately, the objective is to make the AED as small as possible, to be fully portable, and even be delivered by a drone. That sets size and weight restrictions that have to be factored into the design.

Discharging Section

The high voltage discharging section is implemented to provide Biphasic voltage waveform where the current flows in a Bidirectional path to the patient's heart for 10 milliseconds with a maximum energy of 200 Joules.

Isolation Section for Safety

This section provides isolation between the patient and the high voltage charging and discharging sections of the AED device.



Internal Discharge

Internal discharge is used to bring the capacitor voltage to zero. It is achieved using a solid state relay, which discharges any residual capacitor voltage after the shock delivery.

ECG & Impedance Section

The AED reads the ECG signal using two electrodes. An algorithm analyzes the ECG signal and classifies it as having normal or abnormal rhythm based on AHA classification. The classification is used to decide whether or not a shock can be delivered to the patient.

Impedance Measurement Section

The impedance measurement section measures the transthoracic impedance of the patient by passing a low voltage high-frequency signal of $\pm 3v$ at 50 kHz across the patient's heart through the electrodes. Using this impedance value, we can calculate and measure how much energy should be delivered to the patient.

Micro-Controller Section

The Sosaley AED uses a powerful 32-bit micro-controller that acts as the brain for all the above sections. The micro-controller manages all user I/O. The micro-controller also gathers all transactional data on every event. This data is given to the patient's doctor for understanding what further remedial measures are to be given to the patient. The data will also be collected for medical analytics and product improvement.

Development Background

The Sosaley AED has been developed under the aegis of the Madras Institute of Technology and funded by the Department of Science & Technology, Government of India.