Claims

1. An automated external defibrillator (AED), comprising:

two pads to be placed on a patient;

multiple electrode pairs provided on or between the two pads to perform multiple functions of electrical measurement and stimulation of the patient's heart;

a switching circuit and a shock generation circuit connected to the multiple electrode pairs; and

a controller connected to the switching circuit and the shock generation circuit, wherein the controller is configured to perform spatial division multiplexing by rapidly switching between the multiple electrode pairs to automatically perform the multiple functions of electrical measurement and stimulation of the patient's heart using the multiple electrode pairs in multiple directions.

2. The AED of claim 1, wherein the multiple functions of electrical measurement and stimulation of the patient's heart performed by the multiple electrode pairs in multiple directions comprise:

measuring cardiac electrical signals to detect locations of the two pads;

measuring ECG signals to detect shockable cardiac rhythms; and

delivering doses of defibrillation shocks by the two pads based on their detected locations when shockable cardiac rhythms are detected.

3. The AED of claim 1, wherein one of the two pads has one or more electrodes, and the other has two or more electrodes.

4. The AED of claim 2, wherein the measured cardiac electrical signals used to detect locations of the two pads comprise voltage, current, impedance, or any combination thereof.

5. The AED of claim 2, wherein the controller is further configured to analyse the measured cardiac electrical signals to detect locations of the two pads based on signal strengths of the measured cardiac electrical signals in multiple directions between multiple electrode pairs.

6. The AED of claim 2, wherein the detected locations of the two pads comprise locations of the two pads relative to one another and ventricles of the patient's heart.

7. The AED of claim 2, wherein the controller is further configured to control the doses of defibrillation shocks delivered by the two pads based on their detected locations.

8. The AED of claim 1, wherein the controller is further configured to rapidly switch between the multiple electrode pairs and automatically select optimal electrode pairs to perform the multiple functions after multiple point-to-point electrical circuit paths between the multiple electrode pairs have been traversed in multiple directions.

9. The AED of claim 8, wherein the controller is further configured to rapidly switch between the multiple electrode pairs so that any combination of the multiple electrode pairs is used to perform any combination of the multiple functions using any combination of the multiple point-to-point electrical circuit paths between the multiple electrode pairs in any combination of multiple directions.

10. An automated external defibrillator (AED) having two pads configured to be placed on a patient, the AED comprising:

multiple electrode pairs that are configured to be placed on or between the two pads to perform multiple functions of electrical measurement and stimulation of the patient's heart;

wherein the AED is configured to rapidly switch between the multiple electrode pairs to automatically perform the multiple functions of electrical measurement and stimulation of the patient's heart using the multiple electrode pairs in multiple directions.