The Intelligent Medical Stapler: Ending the Emergency Room Crisis

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Emergency rooms are overcrowded with patients seeking medical attention for lacerations, the most common injury after broken bones. Most cuts require a simple treatment: sutures or staples; however, a doctor must complete the procedure. As a result, doctors spend their valuable time on simple stitching, sometimes for fifty percent of their day. The goal of this project is to design a prototype robot which can perform medical staples autonomously, taking the menial task out of doctors' hands. Through research, a design for a rotary delta robot with six axes of rotation and camera tracking was selected to complete the task. The robot uses three motor-powered arms connected to a parallel end effector. This end effector holds a rotational plate, a component which allows the robot to follow curved lacerations. A tilting platform is offset from the rotational plate to perform staples along the side of a patient. Many components are 3D printed parts, with some wooden supports. The final platform with a USB camera and medical stapler can move along six different axes. In the experiment, we could only achieve forty percent of the desired range of motion. However, the camera tracking could successfully identify skin as well as mark and measure a laceration on the skin. The partial success of the prototype shows the potential for growth and development of the product. In the future, through the use of more powerful motors and sophisticated materials, the Intelligent Medical Stapler can transform stressed emergency rooms into hubs of medical innovation.

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