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## Smart Infusion Syringe Pump for Precise Medicine Injection into a Human Body

Hamza Bin Rashid, Ahsan Salman, Hiba Ali,  
Supervisor: Shawkat Ali

Department of Electrical Engineering, National University of Computer and Emerging Sciences, A.K Brohi  
Road H-11/4 Islamabad 44000, Pkaistan

*Medical errors are one of the leading causes of patient expiries around the world. The shortage of affordable and quality healthcare facilities takes hundreds of lives every day in Pakistan alone. According to an article in Washington Post, medical errors are the third leading cause of patient expiries in the USA. Medical errors are not only due to the use of wrong medicine but also due to the improper flow rate of medicine injection in the human body. An infusion pump is a medical device that delivers fluids, such as nutrients and medications, into a patient's body in controlled amounts. Infusion pumps provide flow rate as little as 0.1 ml/hr, this fluid administration would otherwise be impossible if done manually. Infusion Syringe Pumps available in Pakistan have to be imported from either USA or Poland at around 1000 - 1500 US Dollars. It would be beneficial for the healthcare industry of Pakistan if Infusion Syringe Pumps were manufactured locally to minimize cost and increase productivity at local Pakistani hospitals.*

*In this research study we demonstrate a prototype Smart Infusion Syringe Pump for the medical applications in order to inject medicine into a human body through precise flow rate. The flow rate of the medicine is controlled through a controller which takes input from a keypad and execute through number of steps of stepper motor. In order to convert the rotational motion of the motor into linear motion we have utilized a lead screw attached to the rotor of the motor. The plunger of the syringe connected to the screw moves back and forth according to the rotation of the motor causing the syringe to empty itself according to the flow-rate. The minimum flow rate of the proposed infusion pump is 400  $\mu$ L/hr to maximum rate of mL/m which covers almost all types of medicines for all ages of patients. Moreover the infusion pump starts beeping at when the fluid is finished and also sends a message on cell phone of the corresponding doctor. The cost of our proposed infusion pump is less than 150 USD which is far less than the market price of the same device. We hope this design will provide good base for further research and development of the smart infusion pumps.*