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Cutting Edge Wireless-Based Intravenous Stand Robot

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Introduction

Intravenous (IV) stands are biomedical healthcare supportive tools utilized worldwide on daily basis. IV stands carry bags which deliver medications to patients through intravenous injections. IV infusion works based on the weight of the IV tubing fluid. The higher the bag is hung, the greater the pressure triggering the IV fluid to move downward through the tubing. The fluid has to be delivered to the patient until the nurse replaces the bag. Both patients and nurses aid in mobilizing the stand. Several (IV) stands designs exist (see figure below) including (a) the first simple free standing designs, (b) the second simple free standing design, (c) Dyaun IV Pole, (d) Hanging IV Stand, (e) Infusion Pump IV Stand and (f) Lakeside Chrome Infusion Pump Stand.



Problem Statement

IV stands available in the market are not feasibly maneuvered by patients and/or nurses.

IV stands does not contain an intrinsic alarm which alert both the patient and the nurse when the whole saline is delivered and the bag is emptied.

Objectives

To improve current IV stand designs and enhance the healthcare system we aim to:

Design a novel IV stand Robot.

Enrich our IV stand Robot design with an alarm system.

Methodology & Design

From the patient's side

- Connect a joystick to the analog input of Arduino Uno. Through an uploaded code, a digital output is sent to an encoder.
- The encoder is connected to a Radio Frequency transmitter (RF/TX) (an Antenna of 23.5 cm and 315 MHz).

From the stand robot side

- Connect a Radio Frequency receiver (RF/RX) to the decoder. Set the decoder at the digital input of the Arduino Uno.
- Through the digital output of the Arduino, drive 3 Arduino Relay modules. Each of these modules is connected to a DC motor in order to hold the IV stand.

For the fluid detection

- Connect a photodiode that is at the level of the IV fluid bag to the Arduino Uno analog input and warning elements, a buzzer and LED, to the digital output.

Noteworthy, a 12 VDC battery supplies the motors and the Arduino Uno, the remaining electronics are supplied by 5 VDC from the Arduino.

IV Stand Robot



Testing & Results

When the joystick on the transmitting side is moved forward, backward, left and/or right using the finger, the IV stand Robot (receiving side) responds by moving to the same direction using two wheels.

While the joystick is pressed, the robot rotates using 3 wheels.

When the fluid in the IV bag finishes the sensitivity across the photodiode increases, resulting in a beep from the Buzzer, and a power light from the LED.