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Automatic Bed Tracking System in hospitals using IoT

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Abstract: **There is a lack of effective tracking system for the bed availability .This work has taken it, as a key challenge. To solve this problem, our work uses sensors to detect the availability of patient in the bed. This work also broadcasts it to the webpage to all to know the availability of beds using IoT. This theory may limit to short samples and may need more bandwidth for very high samples of bed availability check. This work does not limit only to pandemic, and it can be extended to bed tracking without broadcasting to the web. It can be used to monitoring internally in a hospital administration level.**

Keywords: IoT – Internet of Things

1.0 INTRODUCTION:

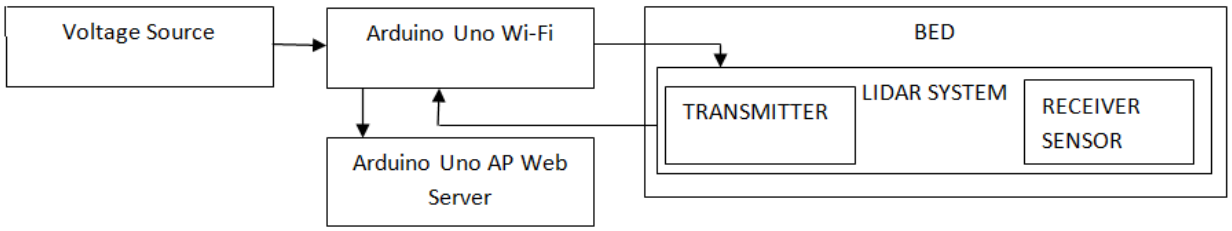
During Pandemic, there was the unavailability of systems to check whether beds were available with the required infrastructure for the affected patient/s. To solve this problem, this work uses the dimensions of the bed as 914 x 2032 mm for this work. This calculation/s can be extended to any hospital bed. This work uses ATMEGA based microcontroller, to control the sensor signal and send the signals to a web portal. The sensor used in this work is the laser-based sensor. When the laser cuts, in between where the patient lies. It compares the calculated velocity of the speed of laser light with the instantaneous velocity of laser light. If the comparison is true, it displays a certain output. When the status is false for a certain time period, this controller prints the value that the bed is available. It works vice-versa for the other case. This work may require the right bandwidth to continuously make status available while hosting it using IoT. It can be used to view it internally without hosting it for administration purposes.

2.0 LITERATURE SURVEY:

2.1 Gnath and et-al have proposed in their work titled "Designing and testing a laser-based vibratory sensor" the parameter/s to be tested and checked while using the laser-based sensor. This work also gave insights into the scope of these sensors. These parameters helped to determine the boundary conditions of our work for laser. On greater researches, these boundaries could be extended, and the bed tracking system could be amplified.

2.2 Shan He, Shilun Feng, and et-al have proposed in their work titled "IoT-Based Laser-Inscribed Sensors for Detection of Sulfate in Water Bodies" for lasers. We used this work for the interface of the sensors with the Wi-fi and the internet system used in the hospital. We have made our calculation for laser-based sensors for the ideal case. This work will support the need for ports for connecting with the internet.

2.3 Dekui LV, Xia Xin Yang, and et al have proposed in their work titled "Research on the technology of LIDAR data processing." about LIDAR. This work has used this paper to understand the use of LIDAR technology in the medical space.



Block Diagram to detect Bed Availability using LIDAR System

3.0 METHODLOGY :

The voltage adapter powers up the Arduino Uno Wi-Fi. The micro-controller controls incoming and outgoing data traffic from the sensor. LIDAR sensor checks the patient availability. This work finds the distance traveled by the LIDAR sensor. If the distance traveled by laser reaches the other side of the bed, then it returns is 1. This is based on the comparison logic used in the Arduino Uno Wi-Fi. We use the binary logic for comparing with the calculated distance. The output feedback from the receiver sensor sends back this signal to the Arduino Uno Wi-Fi board and it could be displayed in the Arduino Web IDE in Arduino Uno Wi-Fi AP. It can be hosted from IP generated from serial monitored using Arduino Uno Wi-Fi AP/ browser. This link could be broadcast to others for viewing across the globe.

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4.0 CALCULATIONS:

4.1 Ideal Calculations for Laser:

4.1.1. Frequency:

C = μ λ

Wavelength of red laser = 700 nm

μ = (3 x 10 ^ 8) / (700 x 10^-9) Hz
= **4.29 x (10^14) Hz**

4.1.2 Energy

E = h μ
= (6.63 x 10 ^ -34) x (4.29 x 10^14)J
= **2.84 x (10^-19) J**

4.1.3. Velocity of red laser when bed's width = 914 mm,

v = 2d/t
or
v = 2d x f
= 1.828 x (4.29 x (10^14)) m/s
= **7.85 x (10^14) m/s**

4.2 Practical methods used for calculations from reference:

4.2.1. Formulas:

4.2.1.1 Wavelength of the modulating signal

C = μ λ

C is the velocity of light in m/s

4.2.1.2 The total distance D' covered by LASER is:

D' = B + 2A = B + (θ * τ) / 2π

where A is the measured distance. B is the distance from the phase measurement unit.

The required distance D, between the beam splitter and the target D = τ * θ / 4π

5.0 INFERENCE:

An automatic Bed Tracking System using IoT is designed to handle the bed requirements during the pandemic. This will be useful in places where automatic bed tracking is necessary. This work may be used in hospitals to monitor bed availability for administration purposes.

6.0 REFERENCES:

[1] Gnath has proposed in their work titled "**Designing and testing a laser based vibratory sensor**" in IOP science on March 2018, Vol 28, No. 4.

[2] **Shan He, Shilun Feng, and et-al have proposed in their work titled** "**IoT-Based Laser-Inscribed Sensors for Detection of Sulfate in Water Bodies**" on Dec 22,2020 in IEEE Open Access , Vol – 8.

[3] Dekui LV, Xiaxin Yang, and et-al has proposed in their work titled "**Research on the technology of LIDAR data processing"** About LIDAR. This work has used this paper to understand the use of LIDAR technology in medical space.