

Smart Bed System In Hospital

Bhamare Rohanta D¹, Borse Ashish A.², Patil Niraj P.³, Patel Ganesh P.⁴,
Prof. S.P.Kerhalkar⁵

^{1,2,3,4} BE Student, mechanical Department, SVIT Chincholi, Nashik

⁵ Professor, mechanical Department, SVIT Chincholi, Nashik

Abstract

In this project, Smart Beds have evolved from simple electronically operated hospital beds to touch-free, intelligent, and connected monitoring systems that can work in any setting. The concept of the Smart Bed originated when single- function capabilities were added to hospital beds. A trained caregiver could electronically manipulate the shape and functions of these beds. This work details the design, simulation, and experimental testing of a mechanically actuated smart hospital bed for ease of hospital patients. The smart hospital bed, or Smartbed, is designed to improve the “turning” process currently performed by health care workers, ensuring that patients are turned consistently and decreasing the labor requirement for caregivers. The mechanical structure of the bed is described, along with its advantages over current Smartbed products. The smart hospital bed, Smartbed, proposed in this work improves upon the designs of currently available products by including an actuating mechanism capable of manipulating patients’ bodies without being physically assisted by a caregiver. While this will eliminate the need for assistance in turning the patient, it is not meant to be utilized without a nurse’s care and supervision the Smartbed is a tool designed to remove one of the more time and labor intensive tasks of caregivers as opposed to replacing their presence all together. Hospital beds are manufactured around the world, with each nation providing its own unique qualities and traits to the hospital beds.

Keyword : linear actuator ,spherical joint , Degree of freedom, Portable system, microcontroller, sensor.

1. Introduction:

Hospitals, rehabilitation homes, nursing homes and retirement homes around the world are dependant upon a quality medical staff to maximize safety of individuals. Staff professionalism, facility quality and the condition of equipment are all key components in medical care which must be taken into account when designing hospitals. Particularly, hospital beds are of recent concern around the world. Pressure ulcers (PUs), also known as decubitus ulcers or bed sores, are localized areas of damage to skin and adjacent tissues due to applied pressure, friction, or shear. These sores most often occur over bony prominences such as the hips, heels, spine, and other joints and are the result of a prolonged lack of blood flow to the affected area. Although the development of these sores is based on a variety of factors such as age, nutrition, skin moisture, and general health, PUs are usually found inpatients suffering from immobility, spinal cord injury, or other severe illnesses and the elderly. Us are not just a source of pain and discomfort for bed and chair bound patients these sores often act as avenues for infection

and other complications, some of which can lead to permanent wounds and loss of life . Over time, these sores can cause the skin and underlying tissues to die, exposing muscle and bone underneath the sores. Currently, the most common practice to prevent PUs is for nurses or caregivers to physically turn patients over from side to side approximately every two hours. This manual repositioning allows parts of a patient's body to recover while the contact forces between their body and the bed are applied elsewhere. However, this system is flawed: according to, only about 66% of patients receive this treatment on a regular basis, most likely due to nursing labor shortages. Turning patients is also shown to be a significant cause of lower back pain in health care workers. In addition the turning process creates distortion and shear stress in the skin, causing damage that this process is meant to prevent. The deployment of hospital beds that could reposition patients consistently without creating shear on patient's skin would both improve the prevention of PUs and significantly reduce the time, labor, and cost of their treatment. Hospital beds of this nature, often called smart beds, are already on the market .

2. Literature Survey:

1] R. Yousefi¹, S. Ostadabbas¹, M. Faezipour¹, M. Nourani ¹, V. Ng ¹, L. Tamil ¹, A. Bowling², D. Behan ³ and M. Pompeo⁴ ,works on “A Smart Bed Platform for Monitoring & Ulcer Prevention”, he conclude that Design and implementation of a proof-of-concept platform of a smart bed that will monitor a patient's in-bed body pressure and other parameters is presented. Machine intelligence is used to analyze data, assess the risk and alert care-givers to intervene at an early stage to prevent pressure ulcers. Specifically, the key algorithms for posture detection, limb tracking and risk assessment and also the architectural structure of the platform are discussed

2]Dayna Hurst, Ron Ordon, works on “The Smart Bed The Ideal Platform for Improved Health and Better Care” they conclude that BAM Labs' TLC System enables us to remotely monitor residents ranging from trends in their heart rate and respiratory rates to bed exits and bed turns. A smart monitoring device without wires is a big plus and an exciting new development that puts Care Homes by RNs at the forefront of smart residential care homes.BAM Labs' TLC System enables caregivers to collect patient data, so we can implement person-centered care based on patterns and trends specific to the individual, which is far more valuable than dealing with a onetime episode.

3] Zachary Govier Brush works on “Design And Control Of A Smart Bed For Pressure Ulcer Prevention” he conclude that This work details the design, modeling, simulation, and open loop testing of the actuating mechanism for a smart hospital bed manufactured to prevent the develop ment of bed sores. The steps taken to augment an unfinished, immobile prototype of the mechanism with the use of theoretical models and practical analysis are illus trated, and the resulting mechanism control program and hardware are provided.

4] Brian Catalano Todd Coolidge work on “Evaluation and Design of a Hospital Bed” to be Manufactured they conclude that Our bed design has been designed with influence from current hospital bed products. Our bed also offers additional features to the beds that are currently used in Chinese hospitals and manufactured in China. Our bed can easily articulate the back, upper, and lower legs, as well as adjust the bed height.

3. Mechanism:

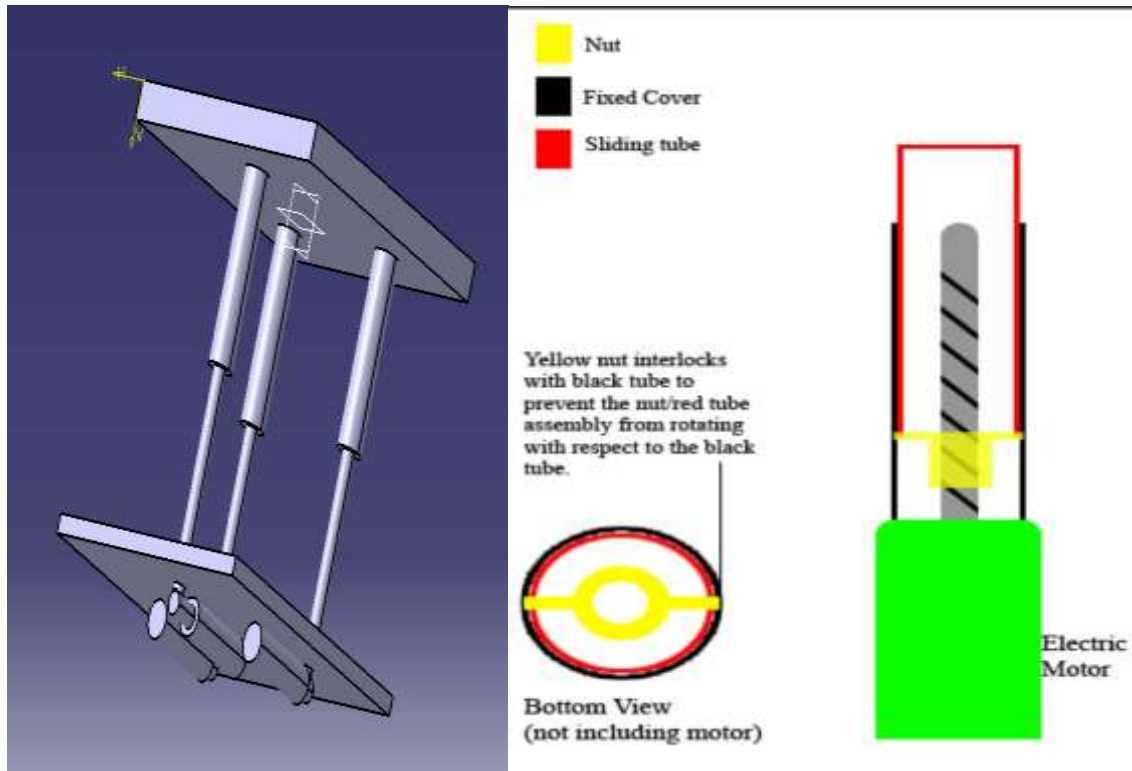


Fig. Single tile

Fig. Linear actuator

4. Objective and Scope of Proposebed System:

- Improve current smart bed system More controllable DOFS
- Determine which are of the highest quality in relationship to price.
- To manufacture a prototype of our bed alterations
- To determine and support the overall quality of the hospital bed

5. Hardware:

1. Motor
2. Linear actuator
- 3coupling
4. Spherical joint
5. Battery
6. Microcontroller

5. Conclusion:

This work details the design, modelling, simulation, and open loop testing of the actuating mechanism for a smart hospital bed manufacture a dynamic model of the system in created in order to select the motors and related components based on torque-speed constraints for each motor provided by the manufacturer. Next, the model is used to determine control equations capable of making the plate follow desired operational space trajectories. The novelty of this work lies in the successful application of an ideal control system developed in simulation to an actual mechanical device.

6. References:

- 1.R. Yousefi 1 , S. Ostadabbas 1 , M. Faezipour 1 , M. Nourani 1 , V. Ng 1 , L. Tamil 1 ,A. Bowling 2 , D. Behan 3 and M. Pompeo 4 conclude that , A Smart Bed Platform for Monitoring & Ulcer Prevention.2012
2. ZACHARY GOVIER BRUSH conclude that DESIGN AND CONTROL OF A SMART BED FOR PRESSURE ULCER PREVENTION.2012
3. BAM Lab concludes that The Smart Bed: The Ideal Platform for Improved Health and Better Care.2012