DESIGN AND DEVELOPMENT OF LOW-COST HEALTH CARE MONITORING ROBOT FOR HEALTH CENTERS IN RURAL AREAS

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Objectives

- Transforming Healthcare with Precision Robotics for Accessible, Sustainable Care

The COVID-19 pandemic exposed healthcare gaps, especially in countries like India. Robots have been effective for COVID-19 testing, patient monitoring, and telemedicine for elderly care. Integrating robots in rural health centers faces challenges due to high costs. 3D Lidar SLAM enhances navigation and autonomy, though lighting sensitivity is an issue. The research aims to develop affordable medical robots with sustainable materials like bamboo and wood, and integrated Lidar SLAM for precise care in rural area

Methodology

Sustainable Materials:

- - Use bamboo for the robotic arm and wood composites for the structure.

Autonomous Navigation:

- - Implement 3D LIDAR sensors for real-time environment mapping.
- - Utilize SLAM algorithms for precise navigation and localization.

Design and Prototyping:

- Develop a working prototype with integrated electronics including encoder motors, Raspberry Pi, Arduino Mega, and custom PCBs.

Telemedicine Integration:

- Equip the robot with a camera, display, and sensors for remote consultations and ntinuous patient monitoring.

Work Plan

- **The work plan involves the following steps:**
- 1. Initial design and material selection.
- 2. Prototype development with sustainable materials.
- 3. Integration of LIDAR-SLAM and telemedicine technologies.
- 4. Testing and refinement of the prototype.
- 5. Deployment in rural healthcare settings and feedback collection.

Results:

- The prototype demonstrated effective autonomous navigation using LIDAR- SLAM.
- Structural analysis confirmed the robot's stability with minimal deflections under various loads.
- Sustainable materials were successfully used, reducing environmental impact.

Conclusions:

- The project achieved its goal of creating an affordable, sustainable, and effective healthcare monitoring robot.
- The use of natural materials helped establish a positive psychological

connection with rural users.

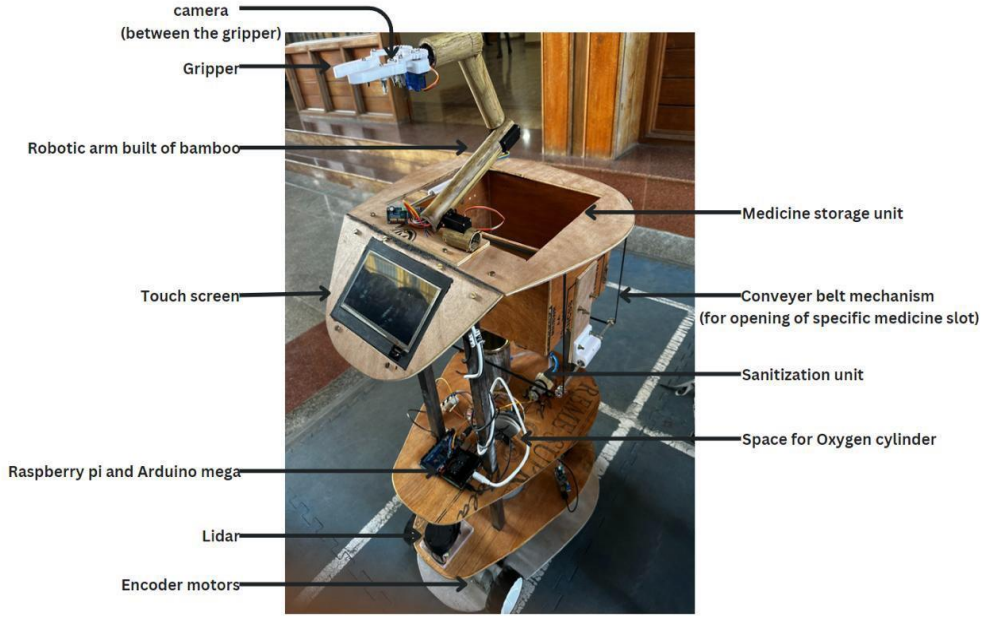
- The integration of advanced navigation and telemedicine technologies enhanced healthcare delivery in underserved areas.

Novelty of the Project Scope for Further Development

- The use of bamboo and wood composites in a healthcare robot is a novel approach, offering sustainability and cost-effectiveness.
- Integration of LIDAR-SLAM for autonomous navigation ensures precise and adaptable movement in dynamic environments.
- Combining robotics with telemedicine bridges the gap in healthcare accessibility in rural areas.

Industrial Collaboration

- Further refinement of the LIDAR-SLAM algorithm to enhance navigation accuracy in diverse settings.
- Expansion of the robot's capabilities to include more complex medical tasks and interactions.
- Testing and deployment in various rural healthcare centers to gather feedback and improve functionality.
- Exploration of additional sustainable materials to further reduce environmental impact.
- Development of training programs for healthcare workers to effectively utilize the robot in their practices.


camera
(between the gripper)
Gripper
Robotic arm built of bamboo
Touch screen
Raspberry pi and Arduino mega
Lidar
Encoder motors
Medicine storage unit
Conveyer belt mechanism
(for opening of specific medicine slot)
Sanitization unit
Space for Oxygen cylinder