

# DESIGN AND DEVELOPMENT OF AN IOT BASED MOBILITY REHABILITATION DEVICE INTEGRATED WITH GAIT PATTERN RECORDING DEVICE FOR ELDERLY AND PHYSICALLY CHALLENGED

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## **Keywords:**

Walking Rollator, Ergonomic Design, LM35, IOT, Gait pattern.

## **Introduction:**

In today's world, mobility disability has been increasing exponentially from year to year. However recent studies show that about 24% of adults in the age group  $\geq 65$  yrs reported use of the mobility device (2019). As per the latest statistics, the rollator walker dominates the walking aid market with a share of 67.4% (2019). This shows us that the Rollator walker is the most prescribed walking aid among the others. Hands free mobility rollator is a four-legged frame with rollators/wheels at the end of the legs. It comes with fully height adjustable seat and handle supports equipped with brakes on both sides. For assured safety it comes with seat 2-point harness seat belt.

The Project aims to design and fabricate an IOT-based mobility rehabilitation device integrated with gait pattern recording device for elderly and physically challenged. Also to improve the design of the rollator walker in a cost-effective and portable way.

1. The handle supports of the rollator walker are first opened and locked in place from the folded form such that the patient fits in the device with ease.
2. Adjustable Handles Which its suitable for most people and it allows the user to stand more upright
3. Pulse sensor is used to monitor the heart rate. Which is placed at the hands of the walker, and it directly connect to the Arduino and proximity sensors are used in step detection. LM35 sensor is used to measure the body temperature
4. when the temperature and the heartbeat of the patient cross the specified limit alarm start and alerting message is sent to the concerned
5. Adjustable underarm support is provided which helps the patient stands comfortably with the support at the back abdomen region.

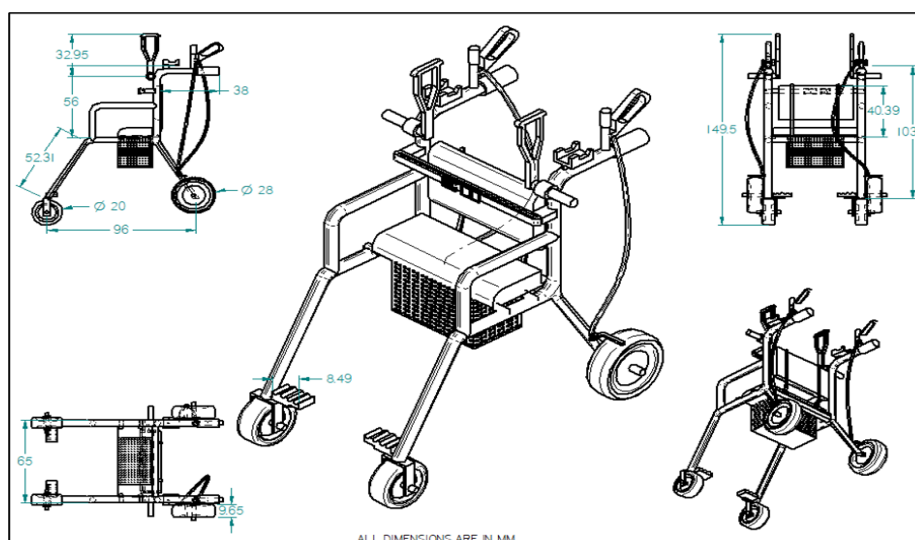
6. Adjustable seat with the comfortable back rest support which also has space for medical kit.
7. During the rehabilitation training, the doctor uses the gait pattern device to record and analyze the gait pattern improvement in the patient.
8. This analysis can procure with the accelerometer the MPC 6050 IMU. It has both 3-Axis of accelerometer and 3-Axis of gyroscope in a single chip which can be used to our advantage. This assembly is worn on the patient's foot with therapy in progress. It is a small measuring device which the data given the foot positioning and velocity at various instants
9. Based on the gait pattern report of the patient over a period the doctor decides about the further therapy.
10. The rollator walker design has been further improved such that the patient can adjust the seat for comfortable seated-walking posture. Further on this device can also be switched to a wheelchair.

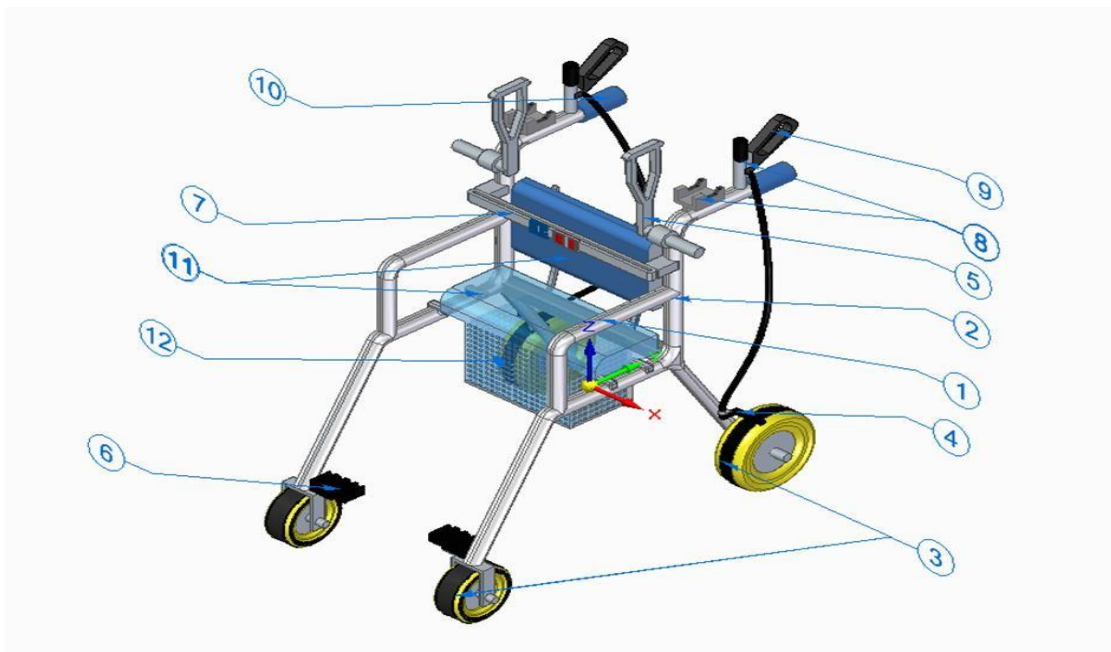
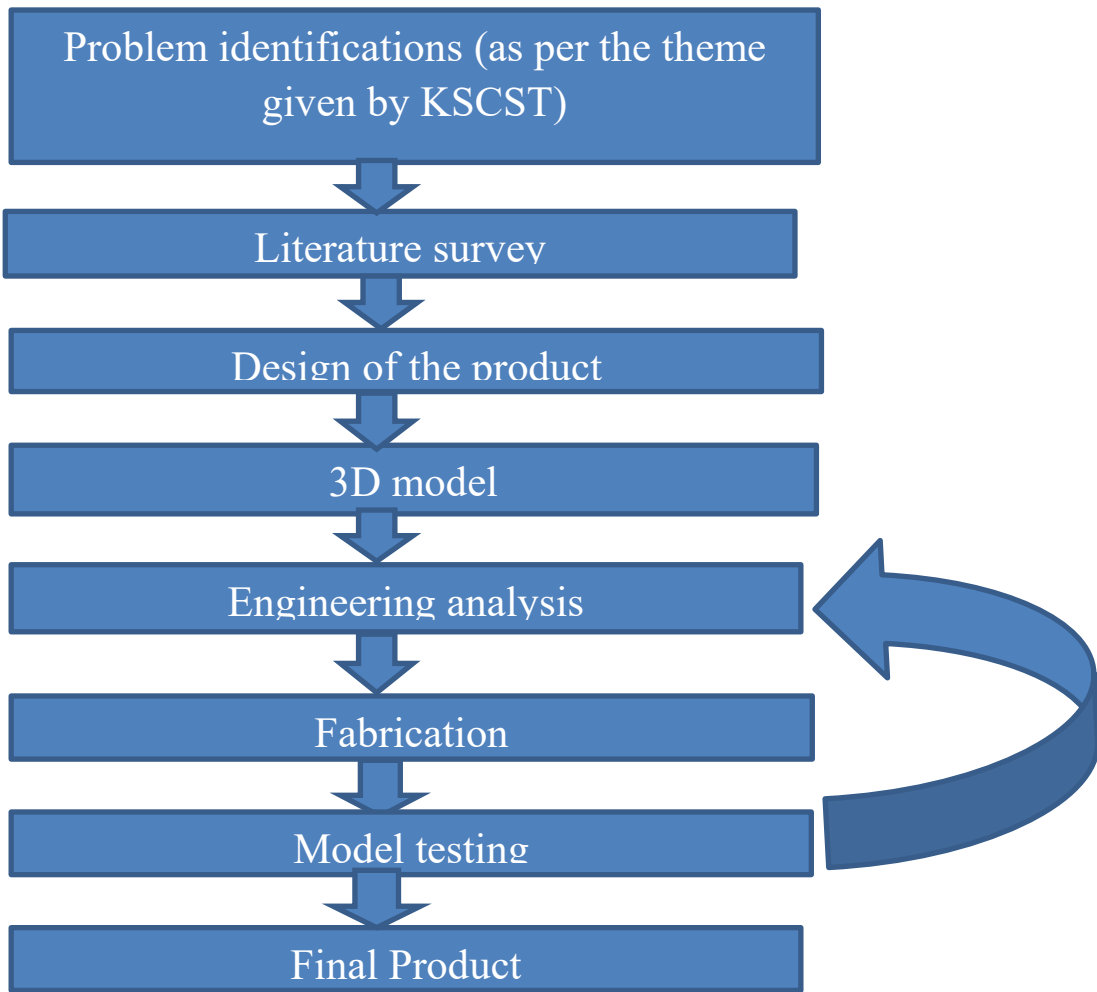
### Objectives:

The Rollator walkers was an ergonomically designed with enhanced operation and portability with gait recorder [1]. After analyzing their work, we observe there is lot of scope for improvement to empower the elderly and physically challenged in real time.

1. This project aims to design and fabricate an IOT based mobility rehabilitation device integrated with gait pattern recording device for elderly and physically challenged.
2. To design gait-pattern monitoring device which goes in-hand with mobility device, making it easy for doctors to monitor and proceed with prescribed therapy.
3. To develop an ergonomically optimized design for easy use, during therapy and for the outdoor activities
4. To improve the design of the rollator walker in a cost-effective and portable device available for the common man.

### Methodology:





**Conclusion:**

1. The Rollator walker contemplates improving a patient's gait pattern and stability in walking along with gait pattern analysis in the form of a graph for better understanding of a patient's progress.
2. Sensors sense the health condition and send the emergency signals to the concerned receiver
3. Adjustable Handles Which its suitable for most people and it allows the user to stand more upright, underarm support which it leads to bend over to use for a long time, comfortable seat with back rest support the cost of rollator is expected to be significantly lower with additional features compared to other rollators in the present market.
4. An ergonomically designed adjustable seat positioning system and transformable alternative wheelchair setup attracting generic patients and other physically challenged patients.
5. Easy to use and maintain with lower costs, thus making it easily available for the common man. Since the device is just a prototype, the future scope of development is exponential.

**Scope for future work:**

1. Development of a software to monitor and schedule real time data on patient's improvement with the assigned therapist/physician for better tracking of the condition.
2. Further reduction and optimization of the overall weight of the frame by switching over to a composite monocoque shell

**Reference:**

Design and development of Rollator Walker with Gait pattern recorder for elderly and physically challenged people (44\_S\_BE\_0185)