Lifting wheelchair for limbless people

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Abstract. He impaired are denied of all open doors for social and monetary turn of events. They have an absence of essential offices like wellbeing, instruction, and business. One of the crippled classifications is individuals who don't have appendages. Limbless individuals face numerous issues like moving starting with one spot then onto the next, climbing steps, taking things from the rack or racks, and so forth. Our task intention is to answer the limbless individuals who are confronting issues in taking the things from the racks at the most extreme stature. We met our locale accomplice concerning this task talked about the issues looked by them. Because they collaborated with their issues, we thought of the most ideal arrangement which comforts and fulfills the client needs. Our item serves the genuinely impeded individuals in the general public in the most effective way.

Keywords: Wheelchair, Limbless, component, ball bearings

1. Introduction

Software Engineering Practical course is a very important main core course for computer science and Engineering. According to course objectives and outcomes and industry requirements, this course mainly encourages student skill set in software project development and maintenance of traditional approaches and methods and new development and maintenance approaches and methods[2],[15,16]. Student required learning these skills and becoming a software engineer need to apply in the job role daily activities as a part of the project development. Student can be able to understand analyze different methods, to collect requirements, analyze the requirements, apply suitable process model, design principles need to follow for effective design, generate a minimum number of essential test cases to test the system functionality, preparation of different kinds of documents like training, help, requirement, design, coding, testing, maintenance documents, etc.[19,20].

Incorporating these skills in students is a very tedious process, we need perfect planning and implementation based on the student ability skill and availability of time and resources. Improved innovation teaching practical course methods to solve problems exist in the traditional teaching software engineering practical course[1].

Introduction:
The incapacitated are denied of all open doors for social and financial turn of events. They have an absence of fundamental offices like wellbeing, training, and business. The State framework is horribly
deficient and ineffectively working where the crippled are concerned. It is assessed that 40 million of more than 100 million youngsters out of school have inabilities. Around 70% of the handicapped are jobless. Millions are very nearly crumbling because of serious handicaps. Individuals with physical incapacities at any rate get saw, however the others with psychological maladjustment are simply composed off[2]. Alongside the physical issues, they likewise endure the worst part of social exclusion and shame. The incapacitated are likewise not a homogenous gathering. There are various kinds of inabilities, with various prerequisites. Each once issues, needs, and help required are not quite the same as the other.

Societal survey:
In Engineering Projects in Community Service, As the part of societal survey, we have visited many communities like Mallikamba Manovikasa kendram, women empowerment center, traffic police, municipalities, etc., and interacted with several people about the problems they are facing in their communities. We finally choose limbless people as our community partners and surveyed their problems.

We visited ladies government hostel and home for disabled boys and some household disabled people to survey on problems faced by the disabled. The majority of them are studying and a few are working. The total number of boys in boy’s hostel is 103 and in ladies hostel is 60. Amongst them, serious disability we identified is leg and hand problems. The 54 members are with leg problems and 6 members are with hand problems. All their belongings are placed in their respective racks. The rack is about 9 feet maximum height and the height of the room is 11 feet. As they are disabled of legs and hands, the height of the people is about 3 to 4.5 feet, so that they are unable to take their daily essentials (clothes, books, things etc...) from a rack manually. Harish who is staying in a boy’s hostel is working as a railway employee, expressed problems faced during the reversing of a cycle due to heavy weight[1,4].

Objectives of physically disabled community:
To overcome these factors, the government developed some communities and their objectives are:

To elevate attention to sharpen society with an emphasis on distant and country territories, on makes driving incapacity and counteraction through early discovery.

To sharpen the businesses and other comparative gatherings on the uncommon needs of particularly debilitated people. To create content for the recovery of various kinds of inabilities. To uphold spreading mindfulness about all-inclusive availability by making an empowering also, boundary-free condition that incorporate available structures, open vehicle, available sites and completing openness review.
Conversation with disability people:

What problems you are facing?

- **Travelling**—while traveling from one place to another it becomes very difficult for us to lift our wheelchairs onto the bus and also into train.
- **Climbing stairs**—we are facing a severe problem while climbing stairs as many of the workplaces and colleges are built above the ground floor.
- **Racks**—we can’t reach the height of the rack while taking our daily essentials.
- **Toilets**—Moving from chair to toilets and vice versa is becoming a problem.
- **Classroom seating**—Government is not providing any seating for us.
- **Wheelchair weight**—the chair’s weight is heavy and we are not able to lift it into trains and buses.
- **Reversing of cycle**—during riding cycle, we feel inconvenient while reversing the cycle due to heavyweight.

Figure 1 a. community partners: rajitha, krishnaveni, shirisha, sushma

Figure 1 b. Vehicle used by limbless people

Figure 1 c. Community partner: Harish

Figure 1 d. Home for disabled boys

Figure 1 e. Racks in girl’s hostel
Problems of physically disabled people:
The problems faced by physically handicapped

- Feeling inconvenient during traveling from one place to another. (40)
- Unable to stand or walk on their own. (54)
- They are unable to take things or clothes from the racks which are at a height. (36)
- Facing problem during climbing stairs.
- Moving from chair to toilets.
- No special seating arrangement in classrooms.[6].
- Walking infrastructure is not available in many places.
- Hand and leg pains.
- Facing problem when rising from the bed.
- Feeling inconvenient during the reversing of the cycle due to heavyweight. (24)

Project impact:
It is estimated that most of the handicapped people are benefitted. More number of amputees gets benefited who wanted some solution to their limbs.

Project statics:
Complete families having debilitated people show an expansion of 20.5lakhs, from 187.3lakhs in 2001 to 207.8lakhs in 2011 (6.2lakhs in-country and 14.3lakhs in metropolitan). Ordinary family units expanded by 2,02,4495, institutional families by 8,370 and houseless family units by 13,560 during the decade 2001-11. Incapacitated people in ordinary families expanded by 48, 19,382, institutional families by 65,895, and houseless family units by 22,948 during the said decade. In Warangal around 2lakhs above individuals are confronting incapacity in body parts, for example, arms, legs, hands, eyes, and so forth.

2. Existing solutions:
Incapacitated individuals are genuinely or intellectually crippled individuals. An individual with a handicap is one who not ready to do the major physical or mental capacity/s of life .the incapacitated are denied of all open doors for social and financial turn of events .the essential offices like wellbeing, instruction, and work are denied to them .it is assessed that around 70% of the handicapped are jobless. It is determined that continuously 2020 be more than 700 million crippled individuals. Over 125 million incapacitated youngsters have a place with creating nations.

For the people who have lower limb disability, movement from one place to a different place is a major problem. Many difficulties are involved with the mobility of the physically challenged individuals within the society. It can be seen that physically disabled people essentially use some helpful devices like artificial chairs, devices, etc., to take things.[7].

Most of the disabled people depend on some other persons. Because of their condition, some are not able to do work or to take of things which are required for their uses from racks .it was being difficult to take things which are at a height and also due to heavyweight.

2.1 Existing solutions for rack problems:
The following section describes the existing solutions

**Height adjustment wheelchair:**

These chairs are useful for disabled people to do and take things that are at a small amount of height without depending on others[8]. They can adjust their seat to a limited height and can sit comfortably. They can do their work by sitting in the chair itself and can be moved from one place to another[9].

![Figure 2 a. model view of height Figure adjustment in wheelchair](image1)

![Figure 2 b. Existing Solutions for height adjustment in wheelchair](image2)

**Taking clothes from cupboard using a Stick:**

This is designed to reduce the strain of disabled people. Using a stick, they can take their clothes or any other small things which are at a certain height in a cupboard.

Clothes rods in closets are too high to be reached easily by anyone in a seated position. Lowering the bar to a maximum height of 54 inches or installing an adjustable bar is recommended.

But also these may become a problem by occurring some injuries because of their imbalance. And also it is not used for everything to take off the things.

![Figure 2 c. Existing solutions for taking clothes from cupboard using a stick](image3)

![Figure 2 d. Wheelchair used for shopping](image4)

**2.2 Summary of existing methods:**

Through our survey, we concluded that some of the disabled people are facing many problems and are not aware of any devices that are available in the market. People who are using devices are facing certain problems.
2.3 Problem statement:
Through our survey, we came to know that, few disabled people who are in the Warangal district are using these devices and facing problems or inconvenience with these devices and are not able to afford them[16].

As a part of the Engineering Project in Community Services (epics) project, we are trying to solve the above problems by providing solutions for them with low cost and high efficient products.

3. Implementation
To develop a kind of wheelchair that is helpful for people with no limbs who cannot take belongings from racks that are at a certain height. Existing tools are applicable for a limited height of about 4cms long which is not so helpful. It is typical to balance the weight of the belongings which are taken from the rack. The existing wheelchair causes strain on arms[15].

Product specification:
The physically handicapped persons are mentioned the product specifications as:

- The base height of the adjustable wheelchair must be comfortable to get into the chair.
- The height of the chair should be adjusted up to the height of the racks.
- The chair should be easily transportable.
- The person must feel easy to handle his/her belongings without any strain.
- It should be ideal for using indoors and outdoors.
- The chair should be fixed in place, while adjusting the height (should not movable).
- The weight capacity of the wheelchair must be less.
- Composite wheels which are present in this chair are lightweight and maintenance-free.
- The chair should be portable and comfortable to the users.
- The chair should not occupy much space.
- The expected cost constraint of this chair should be affordable.

Innovative ideas:
Multiple solutions for height-adjustable wheelchair:

- To adjust the height of the wheelchair we use a rotating screw or pedal using hands.
- Adjusting the height of the chair using a button system. (by pressing the button)
- By providing a joystick we can adjust the height of the chair.

Figure 3 a. Joystick based.  
Figure 3 b. Screws based.
**Best solution:**
We developed a height-adjustable wheelchair-using button system that is very efficient[14], comfortable to the users, affordable by everyone, and can be easily used without putting much effort. It is even reaching the requirements and specifications of the user[13].

![Concept diagram](image)

**Figure 4.** Concept diagram

**4. Designing:**
This section describes the design of the chair.

*Bottom-up development of component designs:*
The components which are used in this product are pre-existing ones. The scissor lift mechanism was developed and other components are arranged to the mechanism was done[10].

*Design specifications for the component:*
the following diagram represents the design specification for the component
**Figure 5.** Design specifications for the component

*Detailed design of the product:*

In the design of the product, firstly we have developed a scissor lift mechanism. A scissor lift is a type of platform which can usually only move vertically; mainly by the use of linked, folding supports in a crisscross ‘X’ pattern to construct the mechanism we have used some of the components like ball bearings, trust bearings, pipes, wheels, chair, wheel locks and some rods in process of developing the product. On the top of the scissor lift[12], we have arranged a seat to sit on it.

The seat will pivot over a pin attached to the rods support legs which are attached to the lift in the back. The rear support legs themselves have supports that are attached to the top of the lift. The threading is also done to the scissor lift to rotate the pedal which is the main part to lift the chair to a certain height[11].

In this design, the wheels are attached to the top of the lift allowing for stability when the lift is extended up while still allowing for mobility[17-19].

![Figure 6 a: Lifting Wheelchair For Limbless People](image1)

![Figure 6 b. NGO feedback Form](image2)

**5. Conclusion:**
The disabled are deprived of all opportunities for social and economic development. They have a lack of basic facilities like health, education, and employment. One of the disabled categories is people who don’t have limbs.

Limbless people face many problems like moving from one place to another, climbing stairs, taking things from the shelf or racks etc. By using this product the user can take things from the racks of certain height on their own and by rotating the lever or pedal which is near the hand rest can adjust the height of the wheelchair as per the requirement.

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