



Automation of Rail Coach for the Physically Disabled

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Abstract: Railway travel for the physically challenged people in India has always been a memory of resentment. Right from the elevated stairs for the coaches allocated for them, the isolation from other coaches thus making them inaccessible to the pantry, improper placement of the restroom, normal people travelling in the special coach allocated to them during season time illegally etc., are some of the major problems faced by the physically challenged in while travelling in trains. Our project aims at addressing the above mentioned problems with possible solutions using embedded electronics.

Keywords: Physically challenged, Railway travel, Elevated steps, Isolated coach.

I. INTRODUCTION

The Indian railways is a huge network connecting the entire country by means of rail lines and the special uniqueness is that the entire huge network of systems are managed under a single management. It is the largest rail network in Asia and follows a multi-gauge, multi-traction system covering over one hundred thousand track kilometres.

Despite being such a large network, it has been able to stand effectively for the past 70 to 80 years yet has many issues to its count. It carries nearly about 30 million passengers daily and reaches to the remotest of part of the country. The above count is increasing in demand year after year. Suburban rail usage has sharply increased over the past five decades, with a 14-fold growth in passenger km of travel (Indian Railways 2001).

Reasons for Increase in demand are growing Population- increase in urban population from 62 million in 1951 to 285 million in 2001 and is estimated to be around 540 million by the year 2021, Extension of cities far beyond old city boundaries, Increased Urban trips - 80 million trips will need to be catered per day, whereas only 37 million trips are being provided by the available rail and bus mass transport facilities, Scattered residential and commercial development without necessary infrastructure .

India appears on the second position in the list of passengers carried in rail transport per year (Countries

with more than 500 million passengers). Even though many advanced technologies or superior designs of coaches have long been made available to people in Europe, Japan and now in China, replicating or adapting those to meet the needs of people in India is far from reality.

Some of the challenges faced by Indian Railways are overcrowding, low frequency and lack of universal design, lack of financial resources, low per-capita income - 23 percent of Indian urban population are living in poverty, extremely low fares- Due to 70% (as per the Census 2011) of Indian population living in rural area, misuse of coach for disabled.

Disability was included in the census for the first time in 2001. As per Census 2001, 2.2% of the population was disabled. This figure is contested by organizations working in the field which estimate India's total disabled population at approximately six per cent or 70 million. As per the recent World Bank report, India has some 40 to 80 million people with disabilities.

Senior Citizens comprise 5% of India's population, and the UN predicts that by 2050, about 536 million Indians will be aged 50 or over, the number of people over 80 is growing at 4% per annum and the population as a whole is growing at 1% per annum, 3.5 million people will be over 100 years old by 2050: over half will live in Asia. Currently 64% of older people live in less developed regions, by 2050 this figure will rise to 80%.

There is a strong correlation between age and disability, two thirds of disabled people are seniors.



Hence, the growing population over 60 that is projected to reach 177 million by 2025 together with India's population of 70 million persons with disabilities is the main reason to make accessibility of the transport system a top priority.

Many attempts have been made by Indian Railways to incorporate the accessibility features at some of the railway stations (like Delhi railway station and Agra Cant railway station) such as earmarked parking for the wheelchair users, accessible entrance, waiting room with accessible toilet and above all inter connectivity of all the platforms with the ramp.

Indian Railways has taken initiative to start manufacturing specially designed coaches having earmarked compartments and toilets adopted to the needs of wheel chair borne/differently-abled persons. Each differently-abled compartment provided in specified coaches has a berthing capacity for 4 passengers including two attendants along with toilet and other amenities. These coaches are attached near the engine or near the guard box. Indian Railways has so far manufactured 2100 such specially designed coaches. It will be the endeavour of the Railways to have one such coach in each mail/express train. Efforts are being made to ensure ease of access to platforms and other areas at stations for differently-abled persons. [1]



Figure 1. Special coach for the physically challenged people

In the United Kingdom, proficiencies have been made by the railway authorities such that a physically disabled person can avail an assist person to aid them during their travel. These assist persons are volunteers for the job. The disabled persons can book assist persons while booking their travel ticket.

In Germany, along with the provision of assist persons, automatic ramps, manual ramps for people with locomotive disability have been provided. Such an effective system is missing in our country.

II. EXISTING FACILITIES

The persons with disabilities act, 1995 was promulgated by government of India to ensure equal opportunities to persons with disabilities and their full participation in nation building. The implementation of the provisions of the act requires a multi sectorial collaborative approach of all Ministries of the Central/State Government including the Ministry of Railways.

A reservation quota of two sleeper class berths has been earmarked in all trains running on non-suburban sections for handicapped person as escort is also allotted the berth out of this quota.

Instructions have also been issued that in the tickets issued through Computerised Passenger Reservation System, to the extent feasible, one lower berth should be allotted to the handicapped person and the person accompanying the handicapped person as an escort should be allotted middle/upper berths near the handicapped person subject to availability of accommodation.

After the departure of the train, the Conductor/Train Ticket Examiner has been authorised to allot the vacant lower berth, if available, to any physically handicapped person travelling on handicapped concessional ticket who has been allotted upper/middle berth, after making necessary entries in the chart.

Specially designed coaches known as SLRD coaches with wider entrance doors to allow a wheel chair to enter, wider aisles modified toilet and 4 berths, the lower two for physically challenged persons and upper berths for attendants have been attached in almost all Mail/Express trains. IR have so far manufactured 2830 SLRD/SRD coaches. [2]

Instructions have been issued that in all Mail/Express trains, the SLRD coaches should be treated as unreserved coaches earmarked for exclusive use of physically handicapped passengers.

Additional facilities include provision of wheel chairs for disabled persons at the stations, creating ramps for easy navigation within platforms, special RFF staffs trained to assist disabled passengers and STD/PCO booths, drinking water amenities specially designed for the disabled and tactile markings for blind people. [3]

Concession ranging from 50% to 75% of the total ticket fare have been made possible for the disabled persons have been made possible.

Railways are issuing photo identity cards to physically-challenged persons to enable them to avail concessions in train tickets in a hassle-free manner. The



photo I-card can be used to book concessional tickets through both ticket counters as well as through the Internet. The card with a unique ID number will have to be carried during journey and produced for on-board verification.

Till now, a physically challenged person used to fill the concession form and produce all relevant documents at the ticket reservation counter to avail the concession in train tickets.

As per the new system, physically-challenged persons will have to approach the nearest Divisional Railway Manager office along with all the relevant documents in original claiming concession and passport size photograph for issuing photo identity card.

The differently-abled is also required to provide a mobile number for communication while applying for the card, the official said.

After due verification by the concerned zonal railways, a photo identity card will be printed containing a unique ID. An automated SMS will be sent to the passenger on given mobile number to collect the card showing the original concession certificate. [4]

After getting the card, the person is not required to fill any concessional form to avail the facility at the counter. Even tickets can be booked on the Internet using the ID number written on the card. The validity of the card will be for five years.

III. PROBLEM IDENTIFICATION

The concession extended by Indian Railways is of no use if the railway stations and rail coaches are not accessible and are often difficult to use by people with various disabilities due to various reasons like- steps at various places No information to passengers regarding train arrival/departures at respective platforms Lack of appropriate directional signage to guide people. Lack of trained staffs available to assist disabled passengers. Absence of accessible toilets Unlevelled surfaces Absence of amenities like drinking water fountains, etc. Lack of provision for inter-platform transfers for people with disabilities putting their safety at question. They are forced to use the railway tracks for crossing hence increasing the risk of accident. [5]

The coach for disabled does not facilitate independent and dignified access to the user as the component of manual assistance invariably remains due to:

- Unlevelled platform

- Tactile warning blocks up to the disabled coach only hence posing trip hazard
- Lack of enforcement leads to overcrowding in coaches for disabled.
- Person with locomotive disability find it difficult to enter the train due to high steps.
- Level difference of the platform and hence the coach does not facilitate independent and dignified access.

These are the various problems that are present in the railways for physically disabled persons despite providing concessions, amenities. We have thought of an idea to address the issue faced by the disabled persons while boarding the coaches allocated for them. Overcrowding and difficult boarding because of height. An automated system can be provided to address both these issues.

The SLRD coach is annexed with the women's coach, but isolated with a barrier, thus making the people travelling in it inaccessible to food, pantry etc.,

The placement of the toilet within the coach is in a position that is accessible only by difficult means of locomotion.



Figure 2. Placement of toilet within the coach



Figure 3. Handle bar provided for locomotion within the coach



Figure 4. Entry door of the coach.

IV. PROPOSED SOLUTION

Let us consider the issue of illegal boarding of other passengers. To overcome this, a railway identification travel card is given to the physically challenged people, similar to aadhar card. This ID card contains the database of the particular person and the database for the travel is to be uploaded at the time of buying the ticket. The door of the coach always remains closed and can be opened only through a authenticated card for that particular train journey. The person can enter and the door closes after a particular interval of time. The number of persons entering the coach is to be monitored and if the count is greater than two, as only two people are allowed in that coach, an alarm is sent to the driver or the guard and they can come and verify and impose a fine if illegal entry is found.

When the card is used for authentication, a ramp is generated when the door is opened and using this blind, leg amputee persons can easily board the train, thus overcoming the problem of elevated stair case.

The models for the above solutions are given below

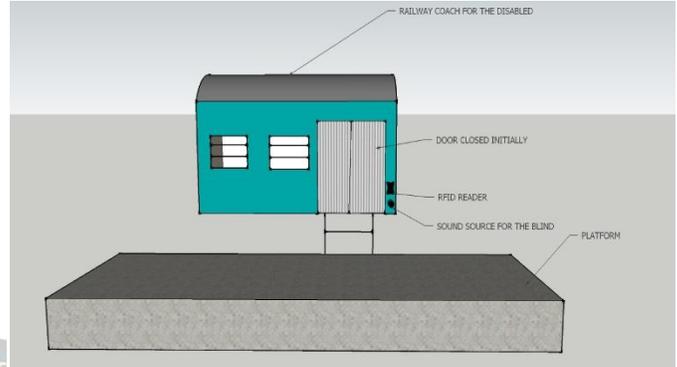


Figure 5. Door closed initially

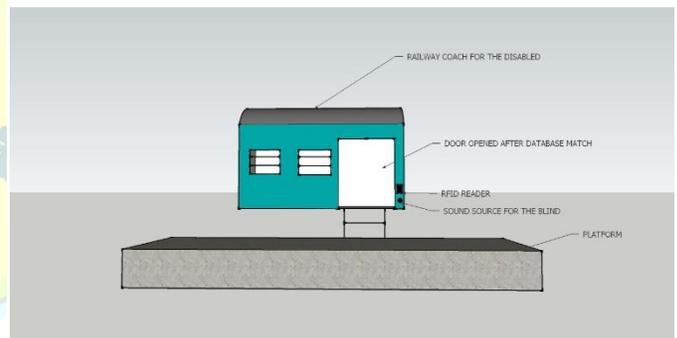


Figure 6. Door open after authenticated entry

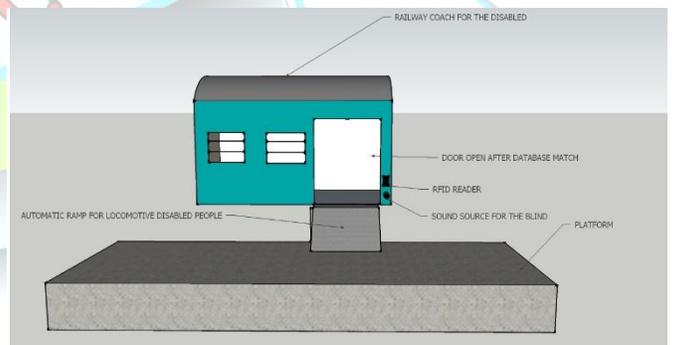


Figure 7. Ramp is generated

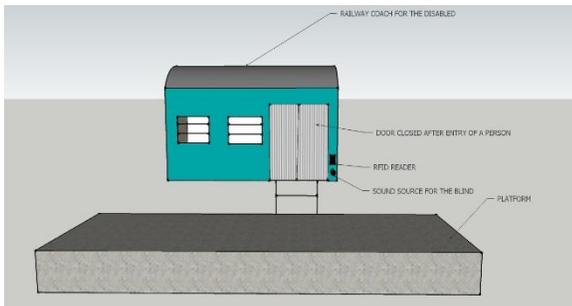


Figure 8. Door closed after entire process

For making the pantry accessible, a conveyor setup could be placed in between the SLRD and women's cabin nearby. A display can be placed and the people can order the food displayed. The message is then sent to the pantry coach and they can acknowledge it, and bring the food till the women's cabin. From there, they can place the food in the conveyor, which will deliver the food to the challenged people in the nearby cabin. The amount can be entered in the ID card and can be collected or paid before the travel.

For the problem of usage of restroom, the toilet can be placed as near the berth, with a sliding door separating the passenger and the restroom. He/ she can access it with the press of a button. The lavatory is covered with a pulley type door and can be open using buttons and motors. Thus the person need not move along the coach to access the toilet as it is placed very close to the berth and also isolated.

The following image provides the model of the entire idea.

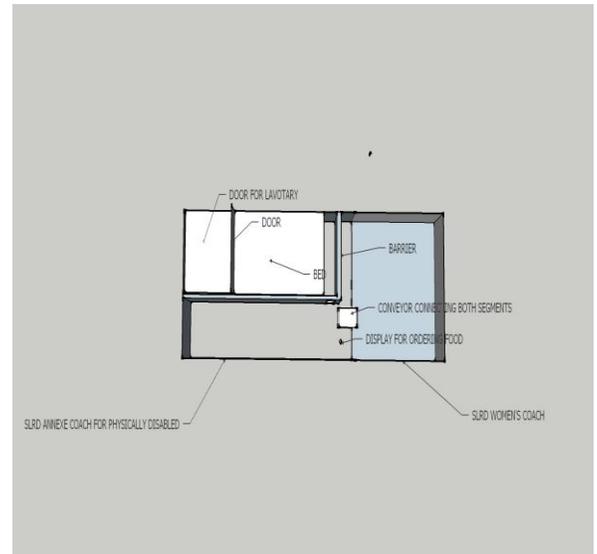


Figure 9. Model of the interior ideas

V. CONCLUSION

These are the various issues that are currently present for the physically disabled persons in the Indian Railways, and if the above suggestions are implemented, some of those issues can be sorted out and the physically challenged people can have a more comfortable train journey.

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