A Collection of Ideas
Architecture
Honors Thesis Project: Redesign of an Indian Railway Station

User Experience Research | Site Analysis | Railway Station Design: Sunita Ram
Architectural Model: Prashanth Godbole
Thesis Advisor: Anant Deo
VNIT, Visvesvaraya National Institute of Technology, India
Redesign of an Indian Railway Station

Indian Railways transports over 18 million passengers and more than 2 million tons of freight daily.

Walk through an Indian Railway Station and you’ll be overwhelmed by shock and delight — of being engulfed by sights, sounds and smells that simultaneously assault all your senses.

- EXPERIENCE: the chaos and clutter of scores of people darting about in their own chosen direction, forming inexplicably complex, web-like traffic patterns. You nervously weave around mail parcels, coolie trolleys and vendors with mobile handcarts, with one motive in mind: to catch the train before it leaves the station.

- EXPERIENCE: the panic of losing sight of your nimble coolie — who walks with all your heavy luggage neatly stacked on his head, as he deftly weaves through all the chaos and confusion.

How is it that a simple, almost trivial journey through an Indian Railway Station can become so inscrutably complex?

**MY DESIGN PROCESS**

- Identify Reasons for Chaos
- Design within Cultural Context
- Simplify the Journey — from the pavement to the platform
- Study inherent and latent Patterns of Behavior
- Design within existing Site Constraints
Dispersion of entire passenger traffic from first platform causes heavy congestion and confusion on first platform.

NEED: An efficient way for passengers to reach their desired platform.

People waiting in the middle of the platform interrupt flow of passenger traffic.

NEED: A segregated area for people who are waiting for their train to arrive.

Movement of mail parcels and food catering trays on platforms interrupt flow of passenger traffic.

NEED: Segregated pathways exclusively for passengers.

Vendors with mobile hand-carts (and their customers) interrupt flow of passenger traffic.

NEED: Vendors and passengers need to co-exist on the platform without disruption to passenger traffic.

1.35 M² necessary — since traffic flow is deviant but only 0.7 M² currently available.

What are the Reasons for Chaos? — and opportunities for design.

Indian Railroad Experience Research
Indian Railroad Experience Research

What are the Details that Work?
Observations and Insights

Railroad experience research and analysis were drawn from studies of the following railway stations:
- Pune
- Nagpur
- Chennai
- Juinagar, Mumbai
- Secunderabad

- Columns aid in visual, spatial segregation of vendors and railway offices from busy passenger traffic paths.

- White tile vs. black asphalt.

- Surface variation can change inherent behavior patterns.

  People are drawn to the white tiled area as a place to rest and wait.

  - Is it cooler to the touch?
  - Does it seem cleaner than the surrounding black tile?

- Skylights allow natural light inside.
- Y-shaped load-bearing columns allow for more circulation space on platforms.
- Metal catwalks at ceiling level carry all electric cables and lights.

- Vendors in alcoves do not encroach onto passenger circulation area.
- Clearly lit store signages do not compete with important railway pictograms and signs.

- Niche between columns used for rainwater pipes, electric cables.
• Who are the different *users*?
• What are their *inherent and latent needs*?
• How can I translate these needs into *design opportunities*?
• How can I design in a way that I retain the *unique cultural texture* of an Indian railway station?

What will it take to make the journey through the railway station to the platform less chaotic and as *simple and intuitive* as possible?
User Experience: PASSENGER

NEED: Design to avoid cross-traffic congestion of incoming and outgoing passengers

CONVENTIONAL DESIGN

PROPOSED DESIGN: allows passengers to disperse to all foot-over-bridges from a main concourse area.

CONVENTIONAL DESIGN

PROPOSED DESIGN: provides segregated, multi-level entry and exit paths for incoming and outgoing passengers.

FACT: Indian trains are often delayed by several hours.

NEED: Passengers need a place to sit/rest. These areas need to be segregated from passenger traffic paths, yet in clear view of oncoming trains.
FACT: Electric outages commonly last for several hours. Hence, “Foot-Over-Bridges” (ramps) are far more reliable than elevators or escalators.

FACT: Indian families travel in the train with a lot of luggage. “Coolies” are porters who are paid a fee to carry this heavy luggage on their heads or by trolley.

FACT: For the passenger and the coolie, upward movement on a long foot-over-bridge is arduous and tiring.

**CONVENTIONAL DESIGN**
Bidirectional movement on foot-over-bridge with heavy luggage can be dangerous.

**PROPOSED DESIGN**
Unidirectional downward movement only.

**BENEFIT:** Minimizes stress inducing motion
Eases cross-traffic congestion
User Experience: VENDOR

CONVENTIONAL DESIGN

Vendors face the tracks — customers interrupt passenger traffic.

PROPOSED DESIGN

Vendors in enclaves — customers diverted from main traffic paths.
PROPOSED DESIGN
Segregated road access to offices and parking areas: avoid cross-movements with passengers.

Segregated service road especially for loading/unloading mail, parcel and food catering building.

DESIGN DECISIONS
• Relocate the primary goods loading and unloading zones to existing Nagpur Central Railway Station.
• Provide separate subway for transfer of mail parcels and railway food catering: avoid cross-movements with passengers.

How can you possibly ensure simple passenger circulation amidst piles of parcels strewn on the platform?
Site Considerations

Current railway station is located in city centre

Proposed Site: Abandoned Ajni goods yard

Current railway station is overcrowded. 0.7m² per person is just not sufficient. 1.35m² per person is essential. (includes extra room for luggage)

CONCOURSE LEVEL PLAN

Site contours and existing track orientation were key determinants in evolution of design.
Sections and Elevations

south east elevation

sectional view
PROPOSED DESIGN
Troughs for coolers and RCC canopies for shade are incorporated into design of building.

Ideas worth exploring
This wall construction is specially designed using Khus panels and is based on evaporative air coolers commonly used in Indian households. Water trickles through the Khus panels and cools the hot summer winds blowing through.

DESIGN OR AN AFTERTHOUGHT?
Make-shift evaporative air-cooler stands and temporary tin structures diminish the architectural integrity of buildings.

Wall section 1:50
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Honors Thesis Project | People Sensor: A mobility aid for the visually impaired

User Experience Research | Orientation and Mobility Aids Research | Electronic Travel Aids Research: Sunita Ram
Technical Components Research | Prototype Production: Jennie Sharf and Sunita Ram
Thesis Advisor: Dan O’ Sullivan

Tisch School of the Arts, Interactive Telecommunications Program [ITP], New York University
“I used to dream about being in a world where being disabled was no big deal, where no one considered it a tragedy. No one thought you were inspiring or felt sorry for you. No one stared at you. I imagined what a relief it would be to be seen everyday as perfectly ordinary.”

By Joan Tollifson

Staring Back — The disability experience from the inside out

QUESTIONS I SOUGHT TO ANSWER:

How can I acknowledge the ability of disabled people and assist in habilitation towards their dream of becoming ‘perfectly ordinary.’

Can I use artificial intelligence to enhance the perceptual abilities of visually impaired people.

What if a pre-programmed chip could tell a visually impaired user about the objects he is going to encounter in his path and his distance from them.

What if he could tell where exactly the person around him stood, so he could make proper eye contact with him/her.

Perhaps such a device could help to add more grace to his gait.

Perhaps it could avoid embarrassing moments of accidental contact with people or objects around.

Perhaps it could reduce anxiety of travel and provide the level of independence that he so fiercely sought.
I want an ETA* that helps me locate doorways, side-view mirrors of cars and other mid-range objects. My guide dog is not good at this.

I just wish I could walk independently with dignity and grace.

Some people want a lot of information from their ETA*. Others just want to get from point A to B and want only the basics. I think of this as the Ford and Chevrolet approach.

Although I am willing to identify myself as "visually impaired", by carrying a cane or using a guide-dog, I am not willing to wear a gigantic, ugly device mounted on my head — even if it will protect me.

As an ETA* instructor, I stress the use of ETA to reinforce, not replace the guide-dog (particularly with overhangs above the dog’s head). I have found that this works quite well.

* ETA: Electronic Travel Aid
An ETA* that uses tactile feedback is really useful to deaf-blind individuals. My visually impaired preschoolers seem to like the tactile feedback too.

Sometimes people don’t realize that my cane has accidently touched them: they get alarmed or angry.

I wore a device as a child that was basically a huge pair of black glasses, with headphones and a battery pack. It was big, bulky and very inconvenient.

I want choices that allow me to carry and use my ETA* in many different ways.

I feel frustrated and helpless when my guide-dog gets distracted.

Auditory feedback from an ETA* clashes with echo-location cues I need to listen for — like differences in the sound of the flooring as my cane taps it.

* ETA: Electronic Travel Aid
People Sensor: Research

- Research for this project included:
  - Interviews with visually impaired people.
  - Observation of mobility patterns of visually impaired people.
  - Interviews with world pioneers in the field of Electronic Travel Aids.
  - Relevant study in the fields of Orientation and Mobility, Electronic Travel Aids and available sensor technologies.

RESEARCH: ORIENTATION AND MOBILITY

APSEA: Orientation and Mobility Services
http://www.apsea.ca/viom.htm

Blind Mobility Research Unit
http://www.psyc.nott.ac.uk/bmru/home.html

Computer Graphic Representations of Visual Space
http://www.lighthouse.org/1lh22u.html

RNIB Factsheet: Mobility and Visually Impaired People
http://www.rnib.org.uk/wesupply/fctsheet/mobility.htm

The Demography of Blind and Visually Impaired Pedestrians
http://www.ul.cs.cmu.edu/books/mobility_aids/00000024.htm

TravelVision
http://www.mindspring.com/~kathyz/index.html

Predicting Vision Problems in Everyday Activities from Vision Testing
http://www.lighthouse.org/1lh22y.html

American Foundation for the Blind
http://www.afb.org

Wayfinding and Universal Design
http://www.lighthouse.org/1lh22z.html

RESEARCH: ELECTRONIC TRAVEL AIDS

Sonar Sensory Aid for the Blind: Effects of training on localization, Spatial memory, and Spatial updating
http://sjuvm.stjohns.edu/rehab/tech94/sonar.html

Sonic Pathfinder

Atlas Speaks and Strider
http://www.arkenstone.org

Sonic Vision (Kaspa)
http://www.sonicvision.co.nz

Voice Vision
http://ourworld.compuserve.com/homepages/Peter_Meijer

The Technology of Electronic Travel Aids
http://www.ul.cs.cmu.edu/books/mobility_aids/00000081.htm

RESEARCH: SENSORS

Pedestrian Sensor
http://www.asim.ch/english/products/products.htm#Data Sheet

PIC Chip Design
http://www.mindspring.com/~sholmes/robotics/ultrasnd.htm

Institute for Practical Robotics
http://www.kipr.com

Ultrasonic Sensors
http://www.uop.edu/~vgong/research/ultra.htm

Exploration of a RISC Distance Sensor
http://vive.cs.berkeley.edu/~paulos/distance_sensor.html

Intelligent Ranging using Infrared Sensors
http://ansl.ee.ucla.edu/ancg/iris/iris.html

Narrow Beam “Smart Sensor”
http://www.interactivelight.com/techno.htm
RESEARCH REVELATIONS

► What are the things that mattered most to the user?
Visually Impaired users wished they could:
• Move with advance knowledge of the presence and location of objects and people in their path.
• Avoid the embarrassment of inadvertent cane contact with people around them.

► Conflicting opinions regarding electronic travel aids:
• Simple, basic information is sufficient for safe and independent travel.
• ‘Vision’ is rich with information and data about the entire surroundings must be given so that the user can interpret and filter it according to his needs.

DETAILS OF DESIGN PROTOTYPE

► People Sensor shall use pyroelectric and ultrasound sensors to locate and differentiate between animate (human) and inanimate (non-human) obstructions in the user’s path.

► People Sensor shall convey information about the surrounding environment as simple tactile messages.

► The distance between the user and the obstruction, along with the nature of the obstruction (human or non-human) shall be deciphered based on the intensity of vibro-tactile feedback.

DESIGN INTENT

► People Sensor is not meant as a stand-alone mobility aid, nor is it intended to replace vision; it is designed to be used in conjunction with such tried and true methods as a long white cane, dog guide or residual vision. It augments the information provided by the primary travel aid, the advantage being that you get the information prior to and not because of contact with the object/person in your path.

► People Sensor attempts to reduce the incidence of such situations by discreetly informing the user of the presence and distance of a person or object. It aims towards reducing traveler anxiety thus giving the user more confidence, independence, and speed in transit. It operates with subtlety of signal output and minimum interference with natural sensory channels.
The Pyroelectric Detector distinguishes between a person and an inanimate object in the path of the user. It detects the presence of a person using a thermal sensing element where optical power is converted into an electrical output.

Since wavelengths near 10 micrometers are required to detect the presence of humans, we chose a pyroelectric detector with a response range from 8 to 14 micrometers.

The detector consists of a protective window (an optical filter for required wavelengths), a thermal sensing element, and integral electronics. The pyroelectric detector is used in conjunction with a fresnel lens of focal length of 2.5 in order to obtain a narrow, focused field of view of 6 degrees.
People Sensor: The Components

The Ultrasonic Sensor determines the distance between the user and the obstruction. It can detect objects from a range of 6 inches to 5 feet. Objects are detected regardless of ambient light levels, color, material, and reflectivity.

Tasks that we set out to accomplish:
• Identify the scope of the design prototype for People Sensor
• Research for components and circuits that would fulfil our needs
• Build the circuits and program the micro-controller.

Circuit showing Ultrasonic Sensor

Ultrasonic Wave Transmission

Pyroelectric Detector

Circuit showing microcontroller and vibrotactile actuator
People Sensor: A Prototype

People Sensor is designed to be used in multiple ways - hand-held, neck-hung or waist-bound.

It is designed to be compact and simple to wear and operate, with a minimal learning curve.

Tactile feedback vs. Audio feedback: audio output is avoided, because it can interfere with the user’s hearing and can compromise perception of environmental aural cues such as echo-location and traffic sounds.
Academic Project | Silhouettes: An interactive installation

Installation Concept and Design: Sunita Ram
Programming: Bruno Vianna
Videography | Installation Set-up: Bruno Vianna and Sunita Ram
Silhouette Dancer: Shobana Ram

Tisch School of the Arts, Interactive Telecommunications Program [ITP], New York University
Silhouettes: An interactive installation

- How do we create interactions with computers where our entire body is at play?

- How can human-computer interactions be seamless and intuitive?

- How do you ideate beyond stationary hand-centric interactions with computers?
Silhouettes: An interactive installation

TECHNIQUE:

- An overhead video camera and a projector are connected to a computer.
- Incoming video data tells us about the person’s position, movements, gestures in the installation space.
- Custom software then generates a corresponding silhouette, which is projected on screen.

The result is that the dancer’s silhouette seems to transparently and instantly respond to the participant.

OBSERVATION:

- Participant exhibits initial wariness, hesitation, slow, unsure steps, often lacking grace.
- The dancer’s silhouette mirrors and imitates the participants direction of motion, whether or not that person intends to interact with the piece.
- Participant reacts to the projected imagery of the dancer’s silhouette — and soon incorporates more rhythm and grace into his gait in imitation.
- Participant does not need to learn a new metaphor to interact with the silhouette.
With gratitude to all my collaborators and mentors.