PROJECT REPORT

Transformative Tech in Engineering

CIVL – 6011 – 001

1. TEAM DESCRIPTION

Team Name: Team Brainstorm

Team Members:

Pavan Dhommata, 23, pursuing master’s degree in civil engineering

Atchut Kumar, 27, pursuing master’s degree in civil engineering

Sai Pranay Logani, 23, pursuing master’s degree in civil engineering

Eric Beck, 39, pursuing bachelor’s degree in electrical/computer engineering

Demetrious Banks, 23, pursuing bachelor's degree in electrical engineering

Pavan Dhommata

pdhmmata@memphis.edu

SUMMARY

Grad in January 2025 with Master of Science in Civil Engineering

SKILLS

- EXCEL
- AutoCAD
- STAAD Pro
- Revit
- Microsoft Office
- Surveying

EDUCATION

University of Memphis (2023 - Present) Memphis, TN
Master of Science Civil Engineering
Expected Graduation Date: January 2025

Jawaharlal Nehru Technological University
(2019 – 2022) Hyderabad, India
Bachelor of Technology in Civil Engineering

PROJECT EXPERIENCE

- **Major Project in Bachelor**: Investigation on the use of rice husk ash to produce eco-friendly construction bricks
- This study demonstrates significant potential for applying RHA in the production of eco-friendly construction bricks
- **Mini Project**: Process of manufacturing of Ready-Mix Concrete and quality assurance
- This project deals with manufacturing ready-mix concrete, control tests for quality aggregates and concrete, safety measures taken in the construction area, and merits and demerits of ready-mix concrete.

ACTIVITIES

- Company Havildar Major in National Cadet Corps, June 2016 – April 2019, Hyderabad, India
- Worked as a Battalion Senior in a camp • Recruited cadets in National Cadet Corps
- Encouraged my junior cadets in participating in the social awareness programs
- Army Attachment Camp, Rajput Regiment, Sept 2017

HONORS

- Won 1st place in AutoCAD and Model-Expo Competitions in Tech-Fest, March 2020, Hyderabad, India

ATCHUT KUMAR GARLAPATI

grlapati@memphis.edu

SUMMARY

Grade in dec 2023 with a master's degree in civil engineering program.

SKILLS

- **Microsoft Office Suite**
- **Mathcad software**
- **AutoCAD software**
- **MATLAB software**
- **Customer Service**
- **STAAD pro**
- **3ds Max**

EDUCATION

University of Memphis - Present), Memphis, TN

Master of Science in Civil Engineering
Expected Graduation Date: May 2021

EXPERIENCE

Cad Engineer, June 2017 – July 2021

M/S Skytech Consultancy,

- As role of cad engineer prepare the cross sections and longitudinal sectional drawings at every 25m chainage of total compound and contour design of total area.
- Present statistical data in various methods

Under Trible welfare department

Research Assistant, November 2019 to December 2020

- Prepare a structural drawing and detailing the structure details of every element in the building like beam, columns, slabs, footings, staircase, overhead tanks by using AutoCAD software.
- Present statistical data in various methods

PROJECT EXPERIENCE Jan 2017 – May 2017

- Comparison of strength characteristics of concrete made by two stage mix approach using fly ash and nominal concrete made by nominal mixing approach.

Universal college of engineering & Tech
Volunteer,

- Organized national level technical fest for the past 2 year,
- Organized blood donation campaigns at universal college of engineering and technology in the year -2016.
- Accrued over 3,500 hours of community service

- **HONORS**

- Awarded dens international scholar award 4000 USD per semester from University of Memphis -2022,

Sai Pranay Logani

slogani@memphis.edu

SUMMARY

Grad in Jan 2025 with a master's degree in Civil Engineering program.

SKILLS

- EXCEL
- AutoCAD software
- Microsoft Office
- STAAD pro
- Surveying

EDUCATION

University of Memphis (2023 - Present) Memphis, TN
Master of Science in Civil Engineering
Expected Graduation Date: January 2025

CMR Institution of technology
(2018 – 2022) Hyderabad, India
B. TECH in Civil Engineering

EXPERIENCE

Graduate Engineer Trainee (August 2022 – October 2022)
My Home Constructions Pvt. Ltd.

- Quantity Surveying
- Estimating and Bidding Software for Crew based Infrastructure Construction.

PROJECT EXPERIENCE

- Analysis of Power Generation from Speed Breakers by making gear arrangements using electronic gadgets.

VOLUNTEER

- Volunteer, in the pandemic situation June - March 2021 Government hospitals, Telangana
- Volunteer, June 2019 - March 2022 CMRIT Library, Hyderabad, Telangana

Activities

- One of the active organizers of Cultural fests, AAGAMA.

Eric M. Beck

ebeck@memphis.edu

SUMMARY

Senior Year Student Of Electrical/Computer Engineering

SKILLS

- EXCEL
- MATLAB
- PSpice
- Arduino IDE
- Microsoft Office
- Soldering
- MIPS Assembly
- Java

EDUCATION

University of Memphis (2019 - Present) Memphis, TN
Bachelor of Science Electrical/Computer Engineering
Expected Graduation Date: May 2023

Southwest Tennessee Community College, Memphis, TN
Associate of Science
Graduation Date: December 2019

EXPERIENCE

Package Handler/Belt Picker
(Feb 2022 – Present)
FedEx Ground

- Loading Trailers (Maximizing Load Volume)
- Pulling/Scanning/Loading materials that are incompatible with automated routing machinery
- Use of Trailer Load App to verify correct trailer routing Packages

Home Systems Integration Tech / Electrician's Helper, April (2016 - August 2018)
Meridian Systems, LLC/ Benchmark Electric, LLC

- Integrating Residential/Commercial AV, Security, and Networks
- Low Voltage and 120/240V Rough in, Trim out, and Equipment Install
- Installing Lutron Automated Lighting systems (Wireless/Hardwired)
- Integrating Residential/Commercial 120/240V Electrical
- Coordination with Relevant Tradesmen/Contractors
- Standby Generator Install/Service/Maintenance

Live Audio Production Tec / Audio Systems Integration Tech (2014 - April 2016)
Peak A/V, LLC

- Load In/Out
- Maintaining/Repairing Equipment
- Live Audio Mixing with Behringer X32
- Integrating Commercial AV Systems Hardware

Demetrious Banks

ddbanks6@memphis.edu

SUMMARY

Grad in may 2023 with a Bachelors degree in Electrical engineering program.

SKILLS

- **Microsoft Office**
- **Orcad software**
- **C++ Programing**
- **Pspice**
- **Matlab**
- **Circuits**
- **Energy Conversion**

EDUCATION

University of Memphis (2020 - Present),

Memphis, TN

Bachelor's of Science in Electrical Engineering Expected Graduation Date: May 2023

Southwest Tennessee Community College(2018 - 2020), Memphis, TN

Associates of Science in Applied Science Completed December 2021

EXPERIENCE

Costco Wholesale Sales Associate , May 2022 – Current

- Provide customer service to members in electronics
- Assisting in pairing member with the right product for them

Walmart Money Center Associate , Febuary 2020 – October 2021

- Assist customers with money service needs (wire transfers, bill pay, etc)
- Assist with customer service task like returns

Academy Sports and Outdoors Sales Associate , May 2018 – October 2019

- Assist customers with finding proper products to match their needs

PROJECT EXPERIENCE

Aug 2022– Dec 2022

- Built wireless charger using mutual inductance and resonating frequency to maximize charging distance

2. ABSTRACT

a. Summary of the problem

In order to improve connections and allow for easier access to bus stops, this project intends to address the problem of roadway connectivity. The emphasis is on locating and eliminating roadblocks, such as parked automobiles, pick-up/drop-off activity, and bike lanes that interact with bus stops, that prohibit buses from pulling up to the curb completely. The project will investigate a variety of options, including platforms that mix bicyclists and pedestrians, floating bus stops next to protected bike lanes, and other steps to increase safety and accessibility for bicyclists, pedestrians, and users of public transit. This project's overarching objective is to improve accessibility and connectivity between bus stops and the neighborhood, increasing commuters' appeal of using public transportation and easing traffic congestion.

b. Background and Current Methods

The Washington, DC, area is currently employing the following techniques to address the issue of roadway connectivity impeding access to bus stops:

Bus Lanes: Several key arteries in the DC area, notably H and I Streets NW and 14th Street NW, now have designated bus lanes. These bus lanes enable buses to avoid gridlock, cutting down on delays and enhancing journey times.

Floating Bus stops: There are several floating bus stops in the Washington, DC, area, such as those on Pennsylvania Avenue Southeast and M Street Southeast, which are situated near the Navy Yard Metro Station and Capitol Hill East Metro Station, respectively. Buses can stop and pick up passengers at these stops without obstructing the bike lane or the sidewalk for cyclists.

Bus Bulbs: at the greater Washington, DC, area, bus bulbs are utilized at a number of locations, particularly on Georgia Avenue, NW, and Rhode Island Avenue, NE. Buses can stop without needing to halt in the center of traffic by stretching the sidewalk onto the road.

Bus Priority Signals: In DC, there are several intersections with bus priority signals, including those at Georgia Avenue NW and 14th Street NW. Buses are granted priority at junctions by these lights, allowing them to pass through the intersection ahead of other traffic.

Shared Streets: The 700 block of L Street NW and 8th Street are two examples of shared streets in Washington, DC.

3. TEAM DYNAMICS AND METHODOLOGIES

a. Team Meeting Schedule:

We met thrice in a week till now to get progress in the project work.

Monday – 4.00 pm to 5.25 pm (In the class)

Wednesday – 4.00 pm to 5.25 pm (In the class)

Friday – 3.00 pm to 4.00 pm (In the library)

b. Team Member Roles:

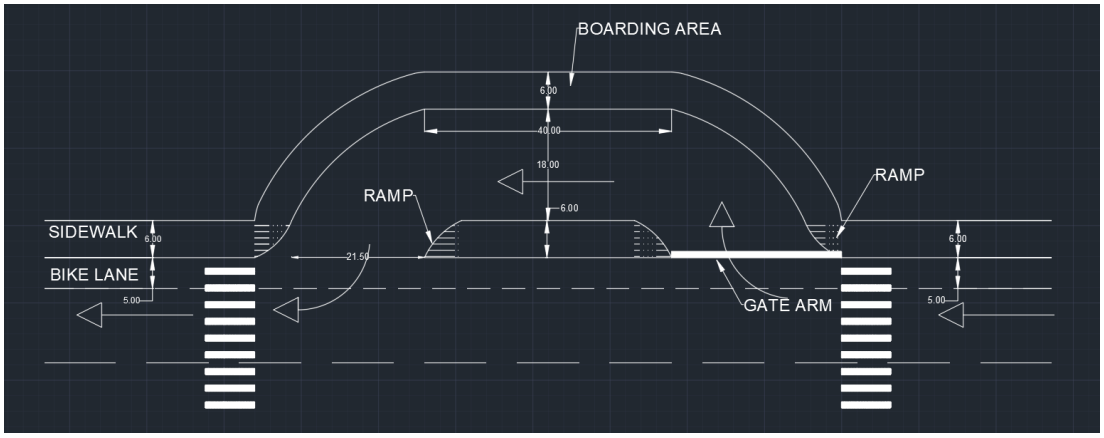
Eric Beck is responsible for AI applications research and scheduling deadlines, and literature review. Demetrious Banks is responsible for AI application research and compiling research results. Pavan Dhommata focuses on structural design research and compiling background information. Atchut Kumar Garlapati is responsible for structural design research and designing presentations. Sai Pranay Logani is responsible for structural design research and writing report.

c. Tentative Project Deadlines:

By the end of April 2023, our team aimed to finish the project proposal. To do this, we intended to meet thrice a week to go through the status and subsequent actions. To ensure that our solution is implemented on schedule, we understand how crucial it is to stick to our deadlines. As a result, we made every effort to stay on course and finished the job by the deadline.

4. MID-TERM UPDATE (March 29, 2023)

Our team has made tremendous advancements on our bus stop enhancement project as of our midterm update. Our analysis of the current bus stop design revealed several potential areas for improvement. Using this data, we used AutoCAD to produce a thorough design for a new bus stop. Numerous features in the new layout will increase bus passengers' safety, accessibility, and convenience.



Bus stop plan designed in the AutoCAD

After interacting with the mentor, we have decided to generalize the solution. So, we focused on Artificial Intelligence and Geographical Information Systems to analyze the bus routes

in the selective region and provide a suitable solution for the respective regional bus stop sidewalk connection problems.

GIS Based Survey

5. FINAL PROJECT SOLUTION DESCRIPTION

a. Description of the problem

Problem Dynamics:

The accessibility and efficiency of bus stops are crucial factors that affect the overall performance of the bus system. A lack of roadway connectivity can indeed obstruct access to bus stops and cause delays in bus operations. Bike lanes that interact with bus stops can create conflicts between cyclists and buses, making it challenging for buses to safely access the curb. Additionally, parked cars and pick-up/drop-off activity can block buses from reaching the curb, causing delays and inconvenience for both bus riders and drivers. To address these issues, it's important to improve roadway connectivity and design bus stops to be more accessible and efficient. This may

involve creating dedicated bus lanes and providing better pedestrian and bicycle access to bus stops. Additionally, implementing bus priority measures such as traffic signal prioritization and queue-jump lanes can help reduce delays and improve bus operations. We plan to make a unique solution that better helps the design process of these bus stops. We will be looking into getting the most optimal route possible using existing technology.

Solution Requirements:

We plan to come up with a solution to help optimize bus stop placement to help get around some of the delays. We plan to use an AI system that will team with a GIS system to help combat many of these challenges of bus stop connectivity. This requires us to take a unique approach to how to structure our solution to this very common problem. To get a correct basis for our solution we plan on using information gathered from The NACTO Transit Street Design Guide. This guide provides official information on what goes into the design process. Using this set of parameters, we can tell what stops are ideal in certain areas and situations, as well as what guidelines must be followed to make sure rules are not being broken when designing a bus stop. The Transit Street Design Guide is based upon professional consensus, city case studies, practices in the urban environment, and research and evaluation of existing designs. The street guide has been certified by practitioners and leaders from the transit and street sectors to ***codify*** and advance ***best practices*** in transit design. Following these standards will be how we base the requirements for our solution.

Stakeholders:

There is a specific group of stakeholders that this solution is aimed to gravitate towards. The main party we are targeting is the city planners. The city planners are the ones that are responsible for the decision-making process of transit design. They also will be the main players

in constructing the desired budgets for city planning. This proposed solution could help neutralize some of the cost that goes into planning. This solution could also provide more optimized routes which could lead to a bigger profit for city transit, more optimized routes could lead to increased usage of the city transit.

b. Description of Solution:

The problem of roadway connectivity preventing access to bus stops can be solved or approached in several ways by utilizing AI and GIS:

Better analysis: With the aid of GIS and AI, transportation planners and engineers are better able to examine traffic patterns, bus routes, and cycling and pedestrian activity. This enables them to spot locations where road design may be impairing the movement of buses and pedestrians.

Making decisions based on data: GIS and AI can offer decision-makers useful data to help them decide where to put enhancements, such as designated bus lanes, floating bus stops, or other steps to improve bus stop sidewalk linkages, into action.

Predictive modeling: Artificial intelligence (AI) can be used to simulate the possible effects of various roadway design scenarios, enabling decision-makers to assess the efficacy of different approaches before they are put into practice.

Increased effectiveness: Transportation engineers and planners can adopt targeted changes to promote efficiency and decrease delays for users of public transportation by identifying locations whereby roadway design may be presenting impediments for buses and pedestrians.

Transportation engineers, planners, data analysts, and local and regional decision-makers are among the participants in this solution. People from the community, including those who use

public transportation, walkers, and riders, can also offer feedback and input to help determine where enhancements are needed. Bus stop sidewalk connections can be improved by public transit organizations like WMATA, which operates in the Washington Metropolitan Area

c. Solution Estimates:

Depending on the size and complexity of the project as well as the precise changes to be made, there will be a range of expenses associated with implementing the solution of combining AI and GIS to enhance bus stop sidewalk connections. However, the following are some rough cost projections for each stage:

Work:

Implementing this solution may involve the following work:

Data collection and analysis: Gathering information on patterns of traffic, bus routes, and bicycle and pedestrian activities, then utilizing GIS and artificial intelligence (AI) techniques to analyze them to pinpoint areas that require improvement.

Creating enhancement plans: Transportation engineers and planners may need to create improvement plans for designated bus lanes, floating bus stops, or additional measures to improve bus stop sidewalk connections.

Improvement implementation: This could involve building new infrastructure or altering existing infrastructure, as well as putting new signage or making other changes.

Estimated Costs:

Depending on the size and complexity of the project as well as the precise changes to be made, there will be a range of expenses associated with implementing the solution of combining AI and

GIS to enhance bus stop sidewalk connections. However, the following are some rough cost projections for each stage:

Data collection and analysis: Using GIS and AI techniques, this phase will collect and analyze data on bus routes, pedestrian and bicycle activity, and traffic patterns. Depending on the project's size and complexity, this phase will cost between $50,000 and $200,000 to complete.

Creating enhancement plans: Transportation engineers and planners will need to create improvement plans for bus stop sidewalk connections, like floating bus stops, dedicated bus lanes, or other solutions. The cost of this phase will vary depending on the project's scope and the difficulty of the applied changes. It might be between $100,000 and $500,000.

Improvement implementation: This stage entails the actual building of new infrastructure, altering already-existing infrastructure, and putting up new signs or making other changes. The price for this stage will differ based on the precise modifications to be made and the project's size. It might be anywhere between $500,000 and 5 million dollars or more.

Overall, depending on the exact requirements of the project, the anticipated cost for executing the solution of utilizing AI and GIS to enhance bus stop sidewalk connections will vary. The cost of doing nothing, however, could be significantly higher in terms of diminished effectiveness, increased delays, and adverse effects on people using public transportation, pedestrians, and bikers.

Timeline:

Depending on the size and scope of the project, the implementation timeline may be as follows: Data gathering and analysis: Depending on the depth of analysis needed, this could take up to six months to a year.

Development of enhancement plans: Depending upon the level of difficulty of the enhancements to be executed, this could take up to six months to a year.

Implementation of improvements: Depending on the precise enhancements to be incorporated and the scope of the project, this could take up to a few years to complete.

The costs associated with adopting this solution will vary depending on several variables, but employing AI and GIS tools to examine data and guide decisions on improvements can result in increased efficiency, decreased delays, enhanced accessibility, and safety, as well as favorable economic and environmental effects.

d. Anticipated Impacts:

Health Impacts:

More people may take public transportation if bus stops are easier to access, which can lower air pollution and enhance air quality.

Riders may feel safer and more comfortable as a result of design changes like the addition of lighting and shelters.

Operational Benefits:

Better bus stop layouts can result in quicker boarding and disembarking, cutting down on wait times and enhancing overall trip times.

Rider confusion can be decreased, and the bus system can be easier to use with clearer signage and wayfinding.

Safety Benefits:

Bus stops can be made safer for users, vehicles, and pedestrians by design changes.

Security cameras and lighting can increase visibility and discourage criminal activities.

Mobility Benefits:

For passengers with disabilities, the elderly, and people with restricted mobility, enhancing bus stop access can boost mobility.

More people may choose to utilize public transportation if new features like seating and shelter are added. These facilities might make awaiting the bus more comfortable.

Environmental Benefits:

Using public transit more frequently can lower carbon emissions and enhance air quality.

Design enhancements can promote biking and walking to bus stops, minimizing the need for automobiles.

Other benefits and risks:

A sense of community pride can be increased, and the neighborhood's general appearance can be improved by better bus stop design.

Construction and implementation could come with some dangers, like delays or disturbances to traffic. However, with careful planning and communication with stakeholders, these risks can be reduced.