Department of Electrical, Electronics, and Communication Engineering
GITAM School of Technology,
GITAM (Deemed to be University), Bengaluru, India

Abstract PROJ3999 (Major Project)

Title: Flood-Free Bengaluru: Harnessing IoT to Solve Underpass Challenges

Project Supervisor: Dr. C. Kamalanathan, Associate Professor,
Department of Electrical, Electronics and Communication Engineering

Cluster Name (AI/ML, VLSI, Comm., CSP, Power Systems): IOT and Communication
Project Coordinator: Dr. M. Arun Kumar, Associate Professor,
Department of Electrical, Electronics and Communication Engineering

Mini Project (PROJ2999) Outcome:

- **Early prediction of weather, rainfall, and water levels in the underpass**

  By predicting rainfall and water stagnant levels in advance, we can deploy resources (like pumps or barricades) to mitigate flooding before it disrupts traffic and affects public health.

  Ultrasonic sensor thresholds with a 2 to 5 cm are commonly used

  Flood detection Threshold level 1 to 2 cm for early alerts

  The pump activation Threshold is 5 to 10 cm to control drainage and free from false alarms.

- **Reduction in Flooding and Traffic Disruptions**

  Upon successful implementation of the proposed model on a small scale, it is expected to benefit approximately 0.5 to 2 million people, ensuring improved health and safety for the community.

- **Real-Time Flood Monitoring and Alerts**

  The drained water from flood mitigation systems can be efficiently stored and distributed for various applications like irrigation, public amenities, or sewer systems

  a) Piping System - Water flow through pipes occurs almost instantaneously, with delays only during peak loads or blockages.
  b) Irrigation System - A single cycle for irrigation takes a few hours to cover large fields (1–4 hours).
  c) Public Amenities - Water can be distributed immediately upon activation, with time-varying by demand and distance.

  Sewer Systems - Water transfer in sewer systems occurs in real time once operational. Delays might occur during maintenance or high-capacity flows

- **Enhanced Public Safety**

Improved Flood Warning Systems - Early Warnings will alert the authorities about the warnings via mobile apps, sirens, and public announcement systems, providing enough time for people to avoid entering flooded underpasses.

Automated Barriers and Flood Gates - Automated systems can be triggered by water level sensors, providing immediate responses even during off-hours or weekends, ensuring public safety.

- **Environmental Benefits**

Sustainable Transportation Systems - Safer Roadways preventing flooding in underpasses, the safety of transportation networks will be enhanced and contribute to smoother traffic flow and fewer accidents, which in turn reduces fuel consumption and emissions.

Extended Project Abstract (up to 300 words):

Urban flooding, particularly in underpasses, presents significant challenges to the safety, mobility, and infrastructure of Bengaluru. This project gives an innovative IoT-based solution to address underpass flooding through real-time monitoring, automated drainage, and traffic management systems. The system integrates wireless sensor networks, weather forecasting models, and water level sensors to detect weather conditions, monitor rainfall, and predict water accumulation in underpasses. Advanced technologies like ultrasonic, capacitive, and pressure sensors enable accurate water level measurements, while automated drainage systems ensure efficient water removal.

Low-latency communication networks utilizing Narrow Band-IoT, LTE-M, 4G, and 5G technologies facilitate seamless data transmission to municipal authorities and public alert systems. A FloodNet sensor network is designed to operate autonomously, providing real-time water depth data with high accuracy. Commuters and the public are informed through LCD displays at underpass entrances and exits, enhancing safety and mobility. The project also calculates a Waterlogging Risk Index (WRI) and conducts Subway Travel Risk Analysis to aid decision-making and ensure sustainable flood management.
By combining IoT technologies with predictive analytics and automated systems, this scalable and cost-effective solution addresses urban flooding comprehensively, offering a safer and more resilient future for Bengaluru.

Extended Project Objective:

This proposal aims to address the issue of underpass flooding in various cities of Bengaluru using I**oT-based innovative solutions,** incorporating Real-Time Monitoring, Automated Responses, and Data-Driven Decision-Making platforms. This integrated technology will not only monitor the problem but also provide sustainable, innovative solutions that are feasible to implement on a scalable level, with the following **objectives:**

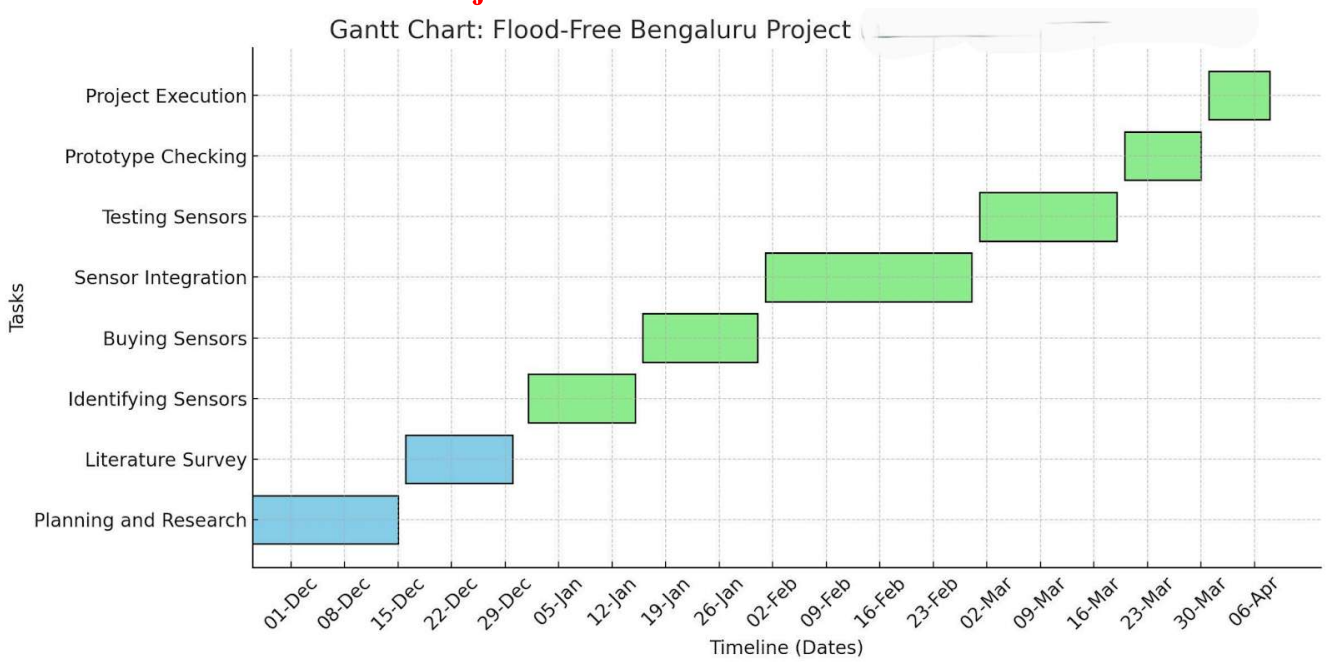
1. Detect weather conditions and monitor rainfall and water levels in underpasses, enabling

early flood risk detection.

2. To deploy automated drainage and traffic management systems that redirect vehicles during underpass flooding, thereby minimizing congestion and accidents.

3. To establish a low-latency communication network that links IoT devices, sensors, control systems, and public alert systems for effective flood management.

Ghent chart for Extended Project PROJ3999:



Suggest 2 IEEE Conference targets:

National Conference on Advances in Engineering and Technology, Bangalore, India, 2025-03-30

International Conference on Computational Intelligence and Communication Networks, Bangalore, India, 2025-01-11

Group Details (Reg No., Name):

1. **Name: Gali Narendra**
   Reg No.: BU21EECE0100166

2. **Name: G. Kula Shekhar Reddy**
   Reg No: BU21EECE0100384

3. **Name: K. Sai Jeevan**
   Reg No.: BU21EECE0100202

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GITAM School of Technology,
GITAM (Deemed to be University), Bengaluru, India

(Project Supervisor Name)

Sign with date