

Grand Challenges Karnataka

Innovating for SDGs

Karnataka State Mobility Grand Challenge

Innovating to Propel Sustainable Mobility

Directorate of Urban Land Transport (DULT), Government of Karnataka

in Association with

**Department of Electronics, Information Technology, Biotechnology and Science &
Technology, Government of Karnataka**

Problem Statements

1. Energy Efficient Sweeping Solution for Cycle Lanes

1. CONTEXT:

In Indian cities, during the pandemic demand for cycling went up many times. In Bengaluru urban alone Strava Metro data showed a 5 fold increase. The governments have also recognised this trend and started planning infrastructure for cycling like dedicated as well as shared cycle tracks separated by kerbs or bollards or any other separators. In Bengaluru, the Directorate of Urban Land Transport was one of the pioneers in the country to conceptualize and design the 34kms pop-up cycle track on the outer ring road as a pilot for the city which has received great reviews. However, for the optimal function of the cycle tracks, maintenance of the infrastructure is very important. The cycle lanes/tracks must be passable and safe, allowing users to move about freely and safely regardless of the season or the weather. Consequently, effective measures need to be taken to deal with the problems caused by rains, leaking flyovers and the associated silt collected on the cycle tracks during the monsoons. Since the cycle tracks are on edges near the kerb, they also tend to accumulate dust, leaves, sometimes garbage which is thrown by citizens etc. When the leaves fall, extra maintenance is necessary since wet leaves constitute a risk for cyclists, making them skid.

2. PROBLEM STATEMENT:

Develop a product solution for energy efficient sweeping of narrow lanes like cycle tracks, which may be located on road or along footpath. The product should be able to operate (like sweeping, turning around, etc. within narrow spaces of 1.25m width. The product should also have ability to clean between objects like bollards (with spacing of 0.6m or more), or barricades without damaging such objects. In the process of cleaning, the product should not damage road markings, like lane markings, stencil markings etc., or other in-pavement devices such as cat-eyes, sensors, if any.

The product should as automated as possible to ensure that entire surface area is cleaned and have sensory abilities to detect silt, trash, dry leaves, stagnant water, etc. and clean them without creating much dust (suction of dust material) or noise. These machines should be able to carry out the cleaning quickly to cover reasonable length of cycle track.

3. RELEVANCE:

Low level of service in cycle tracks due to rubble, dirt accumulation, and open to weather elements causing cyclists to stop using cycle tracks and go back to motorised vehicles. Hence, proper tools to maintain cycle track is a necessity.

2. Contactless Enforcement Solution for Cycle Lanes

1. CONTEXT:

COVID 19 has brought about a revolution in the thinking of cities across the world to reprioritize walking and cycling for building healthier and more resilient cities. In India, as well, this movement has become important since the cities are the fastest urbanizing and this is the right time for the governments to take the cities in the direction of sustainability. With 100 smart cities on the anvil in the country and 7 among them in the state of Karnataka, the Directorate of Urban Land Transport channelizing funds and technical expertise in the cities to build better infrastructure for active mobility. During the pandemic, 9 cities in Karnataka designed and are in the process of building almost 100kms of cycle tracks. However, with the lack of understanding of the usage of the lanes since they are a brand new infrastructure, it is important to bring in enforcement as an important aspect of maintaining infrastructure that encourages people to cycle. The staffing in the police will not be able to catch up to manually enforce violations.

2. PROBLEM STATEMENT:

Develop contact less solutions to identify violation in use of cycle lanes, capture evidence of violation (infringement by other vehicles for movement or stopping) and alert the same to concerned authorities for enforcement.

The solution so developed should be able to automatically detect different forms (shapes, weight, and footprint) of cycles, including smaller cycles designed for children and distinguish from other vehicular forms like motorbikes, mopeds, scooters, etc., which are not allowed on cycle lanes. Cycles are driven at speeds ranging from 10kmph to 60kmph, so the solution should be able to detect cyclist travelling at any speed. The cycle lanes can be of dedicated or shared by design. On shared lanes, mixed use of cycles are other vehicle modes are allowed, however priority on such lanes shall be for cyclists, the solution should be able to detect such situations, where other vehicles fail to yield to a cyclist and capture evidence of the same for reporting. In order to ensure that the solution is configurable to meet changing policies on cycle lane use, the solution should have user interface, where authorized personnel can configure what (type of active mobility) use is legally allowed or not on cycle lanes. Usage of computer vision, image recognition etc. can be utilized for developing a fool-proof enforcement solution. However, the solution should be cost

effective, so that it can be scaled for use at multiple locations across a city without consuming too much resources like internet bandwidth, storage space, etc.

3. RELEVANCE:

Indian cities are only now seeing provisioning of cycling tracks. Encroachment of cycle lanes by motor vehicles is putting lives at risk and derailing the efforts towards creating safe cycling eco-system. It is important to wield disincentives to make safe cycling infrastructure work as intended.

3. Spatial Accident Data Recording

1. CONTEXT:

The information regarding accidents are captured by police manually using forms. However, it commonly found that critical information like exact location of accidents, reason for occurrence of an accident are not captured properly. This may be due to amount needs to be manually written on ground, which could be difficult, especially when the staff are not trained well on the procedures.

2. PROBLEM STATEMENT:

Develop an App/ Online tool that can help authorities to capture the accident information on site with minimal manual inputs. The tool should use Artificial Intelligence (AI) or Machine Learning (ML) techniques to extract information on accidents from photographs or video feeds captured at a location. As an example, the concerned personnel may be required to just capture a photograph of the accident spot, and information of the accident location (exact coordinates), time of reporting, type of vehicles involved, registration numbers of vehicles involved, severity of accident, etc. should be automatically derived from such photographs/video feed.

The authorized personal may only enter additional data, such as number of people involved in an accident, reason for accident etc., manually. The system should also enable personal reporting accident to intimate nearest hospitals, so that hospitals have pre-data of accident victims and process their admission for treatment in a timely manner.

Information from the App should be automatically shared with concerned agencies for further investigation of accident spots and taking up remedial measures as found necessary.

3. RELEVANCE:

Automated generation of accident data would help in capturing of better quality of data that can further be utilized for analyzing accident causes and remedies.

4. Intelligent Grievance Redressal System for Public Transport using AI/ML

1. CONTEXT:

Public transport being a social good and need to serve people to fulfill their mobility needs. People raise their grievances in various forms, including official channels provided by the public transport operators like website, email, Apps, etc. In current days, social media, like Twitter, Facebook, Instagram etc. have become popular tools for commuters to express their grievances and sentiments about their travel experiences in PT. However, grievances received through all means are not easy to collate and address for PT agencies in the current scenario.

2. PROBLEM STATEMENT:

Develop a solution where grievances and sentiments shared by citizens through various media, (both conventional and social media) are collated and analyzed. An Artificial Intelligence (AI) software or Machine Learning (ML) algorithm capable of searching/ scanning various social media postings and deriving grievance and sentiments related to public transport (as per user specification) utilizing appropriate key words/ indications.

An algorithm capable to classifying such grievances and sentiments into appropriate categories. The tool should be able to carry out analysis of the type of frequent grievances, locations for which grievances are frequently reported, etc. The solution may also help in carrying out sentiment analysis derived from social media or online media postings.

The generated information should provide for a dashboard for various levels of management to monitor grievances collated in this manner. Tool should also provide for assigning certain type of grievances to concerned personnel of the public transport agency. The solution will help public transport authorities to quickly understand the type of issues faced by PT users like locations where issues are faced, and frequency of occurrence of such issues.

3. RELEVANCE:

Helps public transport agencies to capture grievance in a robust and comprehensive manner and hence be more efficient in addressing the same to achieve better customer satisfaction.