Land Transport Innovation Portal
Innovation @ LTA

AI-Powered Road Maintenance with Mobile Geotagging

LTA conducts regular inspection of road infrastructures across Singapore in order to ensure motorists' and public safety, to pick up any defects that can be repaired in a timely manner so that Singapore's road infrastructure is functional and safe for use at all times.

Examples of Road-Related Facilities

The process is labour-intensive, which requires the inspectors to drive through, manually pick up and record defects and generate manual reports.

The heavy reliance on manual effort and labour was further highlighted and challenged during the Covid-19 pandemic. In addition, the defects picked up were heavily subjected to inspectors' judgement, knowledge and experience, which led to discrepancies and inconsistencies in defect capturing and reporting.

LTA also leverages on FormSG to collect information and data on active mobility enforcement and road defects. This supplements any gaps in pothole detection that manual inspections may have missed.

However, FormSG is not equipped with geotagging capabilities. Without this capability, the process involved manually identifying locations on Google Maps and transferring the coordinates to FormSG fields. This proved to be time-consuming and inefficient to switch between applications and transfer long numerical values.

H	I	J	K
Location Cleaned	**Landmark of Offence**	**Landmark Cleaned**	**Location**
	Others;EXPO DRIVE X CHANGI SOUTH AVE 1 NEAR LP:38F	Others;EXPO DRIVE X	
BUKIT BATOK WEST AVENUE 5	LP;64-62	LP;64	LP64 BUKIT BATOK WEST AVENUE 5
BUKIT BATOK WEST AVENUE 5	LP;64-60	LP;64	LP64 BUKIT BATOK WEST AVENUE 5
SENGKANG CENTRAL	LP;34	LP;34	LP34 SENGKANG CENTRAL
SENGKANG WEST AVENUE	LP;49 to 47	LP;49	LP49 SENGKANG WEST AVENUE
FERNVALE ROAD	LP;8 to 12	LP;8	LP8 FERNVALE ROAD

Manual Geocoding of location points via Addresses

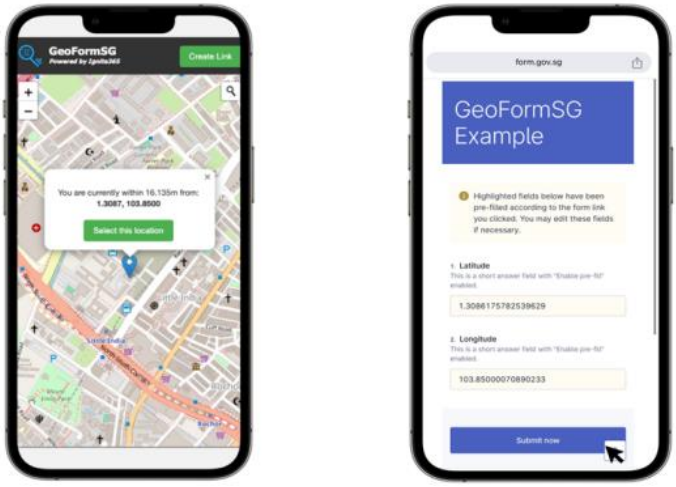
Making use of New Technology Tools

To explore the viability of adopting new technologies into the road inspection process, the team conducted a proof-of-concept to test the existing digital and technological solutions in the market. It was then evaluated that Artificial Intelligence and Video Analytics (AI/VA) solutions

can provide a more cost-efficient, adaptable, and practical way of automated defect detection and reporting, enabling enhanced operational efficiency in our road inspection process.

Using an open-source map engine, GeoFormSG was built to integrate the existing functionalities of FormSG to enable geotagging, resulting in high and widespread impact to operations, with relatively low implementation effort.

GeoFormSG is an internet-enabled website built on top of any FormSG form, allowing users to attach location tags to specific points on a map. On GeoFormSG, users can either pinpoint their location on a map or input an address to obtain corresponding longitude and latitude values. Subsequently with just one click, users are redirected to their FormSG where the geotagged data is automatically captured into the respective fields in the form.



(Left) Screenshot of GeoFormSG App with user's current location detected via GPS

(Right) Screenshot of automatic pre-filling of selected coordinates in FormSG

Reaching New Productivity Gains

LTA has been adopting this nationwide since July 2023. Through this new AI/VA inspection method, we have achieved:

1. Productivity gain of 60% through digitalisation and automation of the road inspection and end-to-end reporting process,
2. Higher accuracy of defect detection to more than 85%, while improving the coverage of the types of defects, and
3. Reduction by 60% in reliance on manual inspection labour and number of inspection vehicles required.

GeoFormSG has similarly produced productivity gains, cutting down the time needed for geotagging by 60%.

Other than time savings, data points in coordinate form are not only useful for pinpointing locations but for downstream data analysis to generate visualisations on the recorded feedback. GeoFormSG ensures good clean data captured right at the source, laying the foundation for insightful data analysis.