

ENHANCED IMAGE PROCESSING BASED POTHOLE IDENTIFICATION AND AUTONOMOUS PATCHING MECHANISM DESIGN

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Abstract : The pothole repair in India is mostly done by labour work which can also call a manual patching. The time required to fill required is high in manual method and wastage of material is high. The pothole filling process required for each season due to environmental changes and traffic density in India. The wages charges and routinely repair made roadways busy for maintenance continuously for year. This all problems lead to design the system which can automatically detect, analyze dimension and then automatically fill or patch the hole on road surface. By using the system with image processing based pothole detection the accurate dimension will be available and by using the available dimensions the filling material will be absolutely required deposited in pothole and it will be pressed. The system can reduce the material wastage, time requirement and wages charges. The need is to automate the whole system to increase accuracy and to make reliable system.

IndexTerms - Automatically, Dimension, Patching, Pothole, Road surface, Sensing, Wages.

I. INTRODUCTION

A pothole is any pavement defect involving the surface or the surface and base, to the extent that it causes significant noticeable impact on vehicle tires and vehicle handling. All potholes are the result of the interaction of water and traffic on pavement. Most are found on local road and street systems: 80% of the nation's roads are local roads and are more apt to have "just grown" rather than being planned from the start and are much more likely to have water, gas and other utilities underneath. [1].

However, potholes are a frequent occurrence anywhere in the world, including in the tropics. Potholes can grow to feet in width, though they usually only become a few inches deep, at most. If they become large enough, damage to tires and vehicle suspensions occurs. Serious road accidents can occur as a direct result, especially on motorways where vehicle speeds are greater. They are frequently almost invisible to road users. Pothole patching is the process of repairing an asphalt based road imperfection. Pothole patching is a year-round activity performed by city and county street department crews to maintain the area's roads and bridges. Pothole patching methods are divided into two distinct categories, hot mix and cold mix. Just as the nomenclature suggests, cold mix is a suitable material for the winter months and hot mix is used during the warm spring and summer seasons. Both the hot and cold mix is applied with similar methods. The most widely used method is known simply as "throw and go".



Figure 1. A pothole caused by fatigue failure

II. PROPOSED SYSTEM

The proposed system acquires potholes images through camera. As the acquired images would be taken under different environmental conditions, various noise filtering techniques would be employed followed by appropriate edge detection algorithms like Canny and Zero cross to identify the boundary of the pothole in the image. After the target area is determined in the image, its dimensional information like area, size and volume would be determined. For this, as the images are taken from different elevations and angles, the top view of the pothole image would be identified from the available image. Orientation could be changed using transformation algorithms like affine transforms. This would be followed by applying appropriate scaling factors to facilitate the area calculating process. After detecting the dimensional information the positioning system activates and after accurate positioning the filler starts to drop material as calculated.

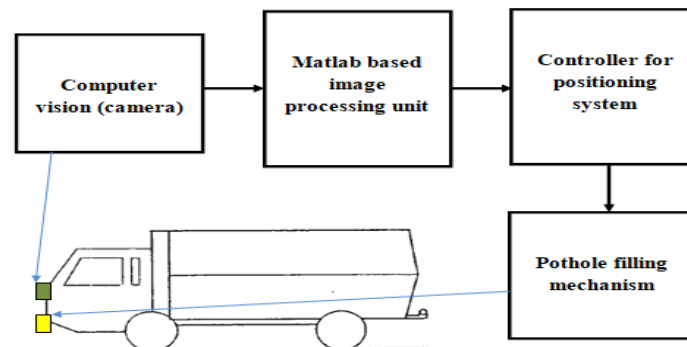


Figure 2. Proposed system of pothole repair

A vision system was needed to take images of the pothole being repaired. These video images would be used to automate the repair process. The imaging of the pavement surface and pothole had to be handled under a variety of lighting conditions. The automatic system had to recognize potholes as well as oddly shaped or colored defects on the pavement. The system would have to create the necessary information to run the remote manipulator under automatic control, and also help the operator monitor the repair process through a TV monitor. This system would fill the prepared cavity with selected and proven materials, under automatic control, to achieve a dense patch having a level surface that would last years. It had to be low maintenance and accommodate variations in materials, application temperatures, oddly shaped potholes of virtually any depth from 1 inch to 6 inches (2.5 to 15 cm). An objective is the system should use low-cost materials that could be easily obtained, and be adaptable to new materials under development in the industry. The truck base had to allow for substantial material storage and weight, easy mobility in repair situations, excellent visibility for the operator and flexibility in design features to accommodate the various repair equipment modules that would have to be mounted.

III. IMPLEMENTED SYSTEM



Figure 3. Implemented system of pothole repair

The truck base had to allow for substantial material storage and weight, easy mobility in repair situations, excellent visibility for the operator and flexibility in design features to accommodate the various repair equipment modules that would have to be mounted.

IV. RESULTS

Table 1 Result

Side	position	X axis	Y axis	Resultant image
L	S	434	91	
L	E	418	420	
R	S	190	63	
R	E	150	404	

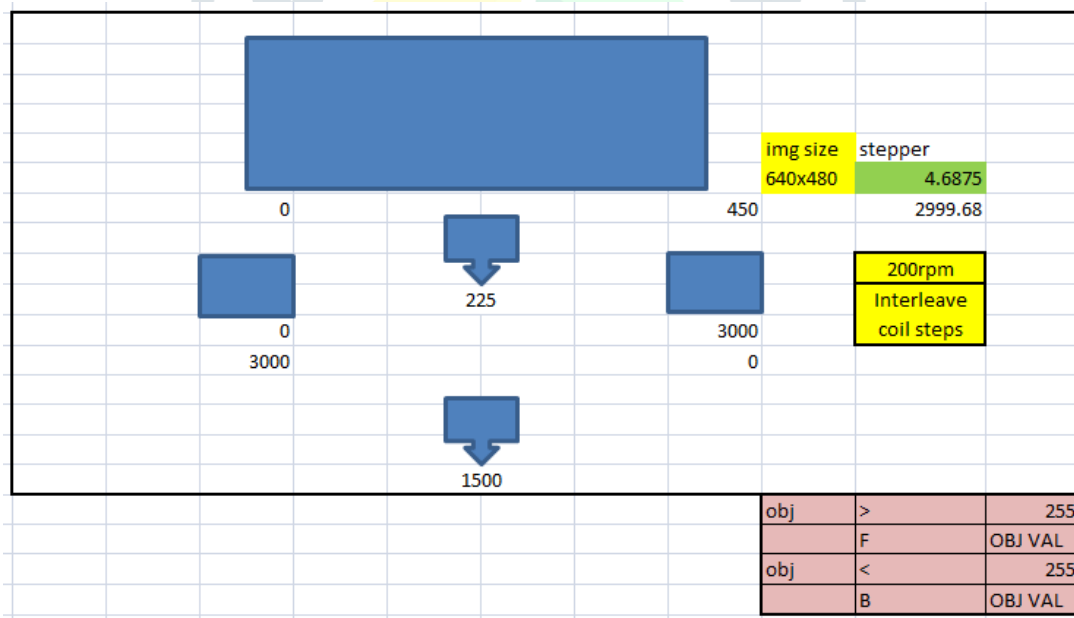


Figure 4. Hardware positioning calculation

V. CONCLUSION

The advanced version of automatic pothole identification and filling system gives a economical and reliable system for pothole identification, dimensional analysis and accordingly position the filler to drop material used to pavement on pothole. It will remove the labour cost, reduces time and also plays a role for emergency repair after damage due to environmental effects.

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