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Research Article

Pipe Loc AI: Revolutionizing Underground Pipeline Location with Artificial Intelligence

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I N F O

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A B S T R A C T

The paper proposes an application to improve the accuracy of tracking readings for pipeline layers. The system uses an AI camera to scan the tracker's screen, automatically capturing data and sending it to a database. This solution eliminates errors and allows trackers to work more efficiently, leading to increased wages and better management of the site. The software also assists trackers in entering information and planning their activities.

Keywords: Flutter, OSM Map API, Google ML vision, Firebase.

Introduction

Tracker performs a variety of tasks at the pipeline installation site, such as employing a tracking equipment to record the location of the pipe and transmit information to the administrator. A tracker's manually gathered observations are frequently prone to mistake. Many trackers procrastinate at work and take longer than necessary to complete tasks; as a result, they demand higher pay. The working system was entirely manual in the past. There is no method to verify whether the readings are accurate because the tracker must record each reading using the tracking device, note any irregularities, and then report the notes to the manager. Therefore, the work was not authentic. Additionally, there is no way to verify whether the employee actually worked on that particular day or not, so they are free to slack off and yet request payment.

The goal is to automate trackers' manual field operations for greater productivity and accuracy. a programme with camera vision, database connectivity, and the ability to save pipe depth and latitude and longitude without operator intervention. Additionally, it will assist the planner in mapping out the tracker's route and monitoring its progress. The pipeline's path or route is planned, and the tracker is informed of this path. The tracker travels along the route and arrives at the destination.

He turns on his machine and places his phone on the tracker's stand above the screen once it is in the proper position to work. The information about location and depth is fetched and sent to the database as soon as he begins working and captures an image of the screen. These latitude and longitude are also presented in real time on the map so that the tracker may monitor his movement and contrast it with the predetermined path.

Figure 1

Litreture Review

In horizontal drilling operations, the DigiTrak F5 Positioning System is utilised to find and follow transmitters mounted at the wellhead. The portable receiver, transmitter, drill rig remote display, battery charger, and three lithium-ion (Li-Ion) batteries that power the receiver and remote display make up an entire F5 system.

The F5 system offers a variety of transmitter options. These include a dual frequency transmitter, a cable transmitter, and five different frequency options (1.4kHz, 8.8kHz, 11kHz, 19.5kHz, and 21.2kHz). The following options are available: a steering for drilling with walkover tracking; a Fluid Pressure Transmitter (FPT) to monitor annular mud pressure in the pilot hole; a DigiTrak transmitter to measure retraction forces between the reamer and the pulled product. Moreover, a tool (SST) transmitter is provided. Manual observations made from trackers are frequently erroneous. Due to their poor work habits and excessive work hours, many trackers are asking for increased pay. This issue is resolved by locometers, which are automated, able to improve reading accuracy, and allow planners to keep track of tracker activity.

Working of Locometer

General Architecture

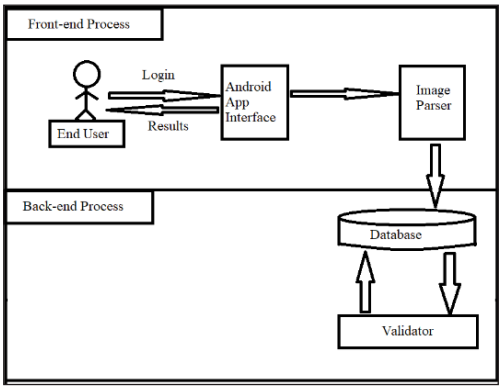

Figure 2. Working model of Locometer

Module Description

Front-End Process-

Android App Interface- This app provides an interface between user and the database. It hides the internalworking and provide an abstract view to the user.

Image Parser – Image parser extract the information from the screen of the tracker machine using computer vision.

Algorithm

Step 1: Image acquisition

First of all, the images are collected from variousresources with their label.

Step 2: Preprocessing

Preprocessing is done is order to make the raw data useful for computer so that it can make some sense outof it. The noise of data is reduced in this step.

Step 3: Segmentation

In this step the characters are grouped together inmeaningful chunks.

Step 4: Feature Extraction

The input data is splitted into a set of features to findnecessary details to make pattern recognizable.

Step 5: Training

After extracting all features, they are fetched to a MLmodel for training purpose.

Step 6: Post-processing

In this stage the model is refined for more correctionsin the OCR model

Back-End Process

Database- It stores the information fetched from the screen and snapshot of the screen.

The data is sent using Firebase API.

Validator- The administrator can act as the validator by comparing the database information with the snapshot ofscreen.

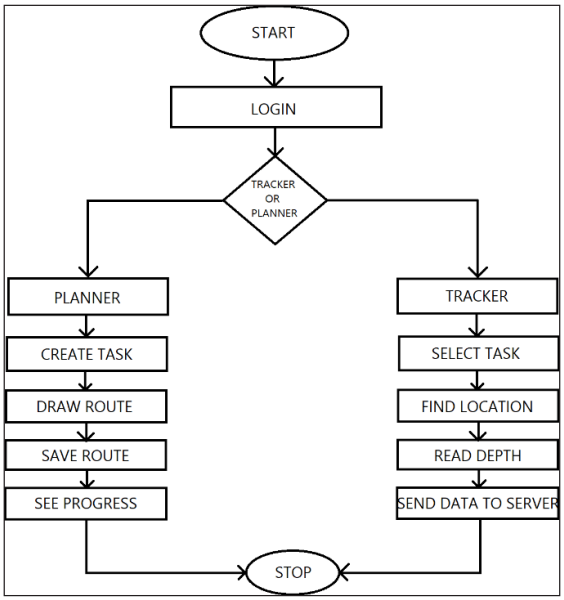

Figure 3

Tracker turns on the locometer.

Tracker checks their task and destination.

Tracker clicks the image of the screen.

Text is fetched from the image and sent to thedatabase.

Task status is updated and the current route is visibleon the map.

The Locometer has two active actors and one operating camera:

TRACKER - Tracker can login and logout in its profile. It can open task and map and work according to the task and path

assigned to him It use tracking tool to store depth latitude longitude of the pipe on database.

PLANNER - Planner can login and logout into its profile. It canassign task and plan route on map for the tracker. It can also see the progress of the task done by tracker.

Experimental Result Description

Screenshots of Implimented System

Figure 4.Camera UI

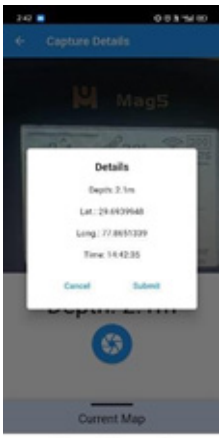

Figure 5.Fetched Details

for the image capturing phase. The user can fetch the depth of pipeline from the tracker's screen as shown in the camera by simply tapping on the capture button. The real time depth is shown on the screen so that tracker can check if data is accurate before capturing it.

Figure 5 shows the captured data from the tracker screen. Depth is the real time depth of pipeline extracted from the tracker screen.

Lat. stands for Latitude and Long. stands for longitude of mobile phone in which the proposed application is running so that the actual location of pipeline can be tracked.

Time is the timing of capturing the whole data.

In figure 4 top left corner the depth of pipeline is show. That depth is captured by Locometer and the output is shown in the figure 5 as a dialogue box.

Model Accuracy Table

Table 1

Total images	Correctly predicted	Wrongly prediced	Accuracy
10	8	2	80%
20	17	3	85%
30	26	4	86.6%
50	42	8	84%
100	83	17	83%

In the above table the data is given for correctly predicted images and wrongly predicted images. In most of the wrong cases values which are not depth like temperature are predicted as depth and sometimes the digits get missed like 1.6m is predicted as 6m.

After carefully observing the system is found that wrong results are mostly due to poor lightning or the device used to take image has a camera with low resolution.

These problems can be overcome by taking care of light-ingin nights and mobile phones used should have a good resolution camera.

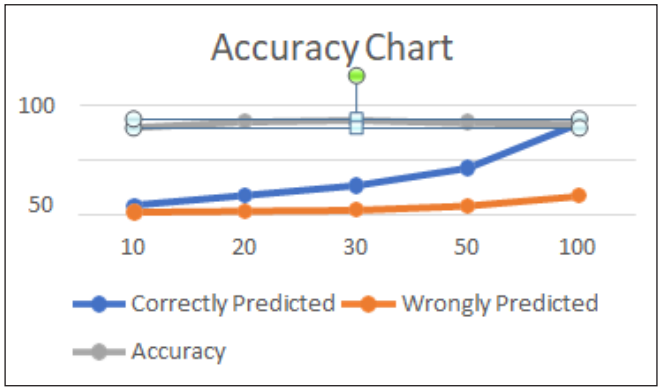

Figure 6.Accuracy Graph

At the working site of tracker while laying pipelines there are various functions of tracker such as capturing the location of pipe using tracking machine and sending them to the administrator. The observation obtained by a tracker manually are often error prone. This paper provides all those services, which he needs while managing the site. In today's world there is a lot of problem with the owner of the drilling organization to maintain their important information and

the documents that they are receiving from tracker and planner. Previously the working system was fully manual. So, there was no authenticity of the work. The objective is to automate the manual working of trackers on the field for more efficiency and accuracy in work. It will also help planner to plan the path of the tracker and track the progress of tracker. Planner plans for the path or route for the pipeline and then this route is shared with the tracker. locate and track a transmitter installed in the drill head. There are several transmitter options available for use with the F5 system. transmitters, and a cable transmitter. The observation obtained by a tracker manually are often error prone. Tracker turns on the locometer. Tracker checks their task and destination. Tracker clicks the image of the screen. Text is fetched from the image and sent to the database. Task status is updated and the current route is visible on the map. TRACKER - Tracker can login and logout in its profile. PLANNER - Planner can login and logout into its profile. It can assign task and plan route on map for the tracker.