INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY
HYDERABAD

R&D SHOWCASE 2021

GEO-LOCATING UAVs FROM ANALOG VIDEO DATA

ABSTRACT

Unmanned Aerial Vehicles or UAVs are becoming a key platform for a wide variety of applications like disaster assessment, traffic monitoring, target tracking, etc. Since most of these UAVs are flown independently, it is necessary to know their geo-locations for better airspace monitoring and management. To effectively integrate information obtained from video streams generated by multiple UAVs, the proposed solution provides a GUI to process videos, train and evaluate a SVM for extracting the relevant information from them, while addressing the video/image challenges posed due to analog video capture with continuously changing background and foreground information. The developed model and prototype show that the trained model performs well and achieves a text recognition level of more than 99% and can recognise text even when it is faint to the human eye.

METHODOLOGY

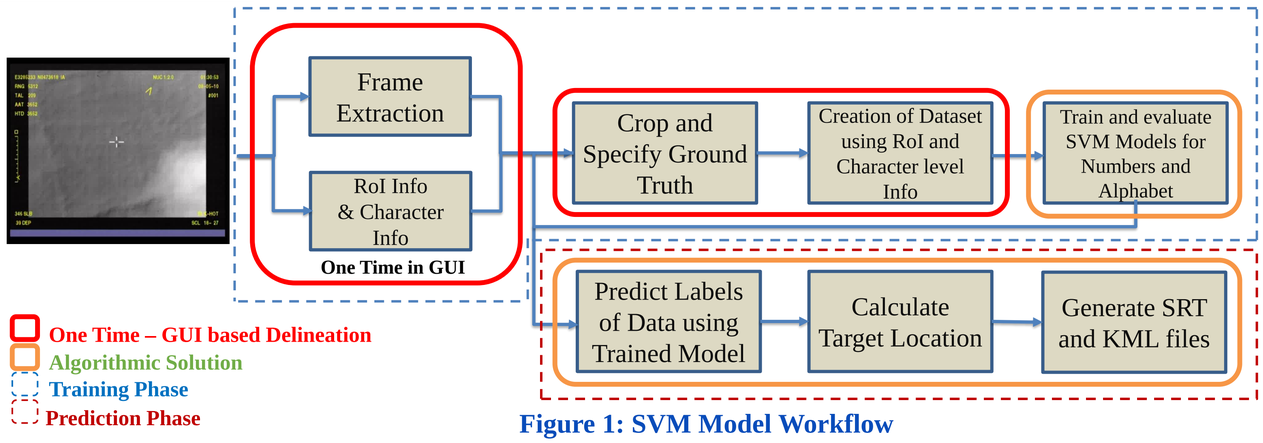

Figure 1: SVM Model Workflow

SUMMARY OF DATA

Table 1: Data Summery

Number of Frames	2826
Frame Rate	25 FPS
Number of Regions of Textual Data per frame	20
Number of Characters per frame	55

SUMMARY OF MODEL

Table 2: Hyperparameters Summary

Algorithm	SVM with Radial Basis Function Kernel
C (Alphabetic)	100
Gamma (Alphabetic)	0.0001
C (Numeric)	10
Gamma (Numeric)	0.0001

PERFORMANC STATISTICS

Table 3: Numeric Data Scores

Character	precision	recall	f1-score	support
0	1	1	1	2717
1	0.98	1	0.99	3292
2	1	1	1	3271
3	1	0.99	1	1806
4	1	1	1	1607
5	1	0.99	0.99	1494
6	1	1	1	1661
7	1	0.99	0.99	1698
8	1	0.99	0.99	1219
9	1	0.99	1	1017
Wt. Average	1	1	1	19782

Table 4: Alphabetic Data Scores

Character	precision	recall	f1-score	support
A	1	1	1	1705
B	1	0.99	1	579
D	1	1	1	1123
E	1	1	1	1156
G	1	1	1	535
H	1	1	1	598
L	1	1	1	1137
N	1	1	1	1107
P	1	0.98	0.99	568
R	1	1	1	536
S	1	1	1	581
T	0.99	1	0.99	1679
Wt Average	1	1	1	11304

Table 5: Accuracies during Validation and Testing Phases

	10 fold Cross validation	Test Accuracy
Alphabetic	0.99697	0.9976
Numeric	0.99531	0.9950

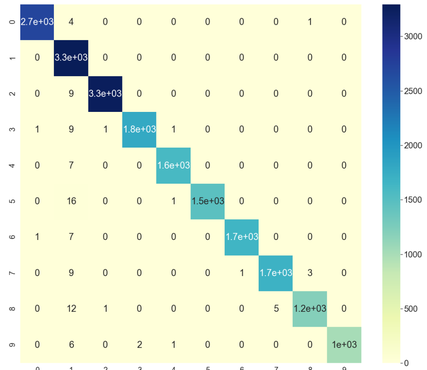

Figure 2: Confusion Matrix of Test Numeric Data

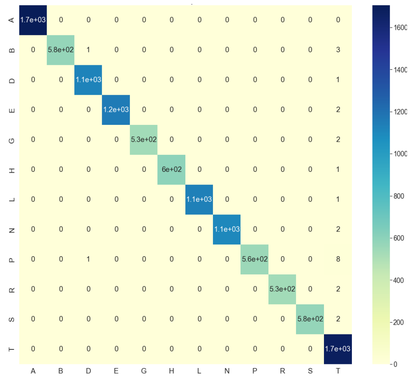

Figure 3: Confusion Matrix of Test Alphabetic Data

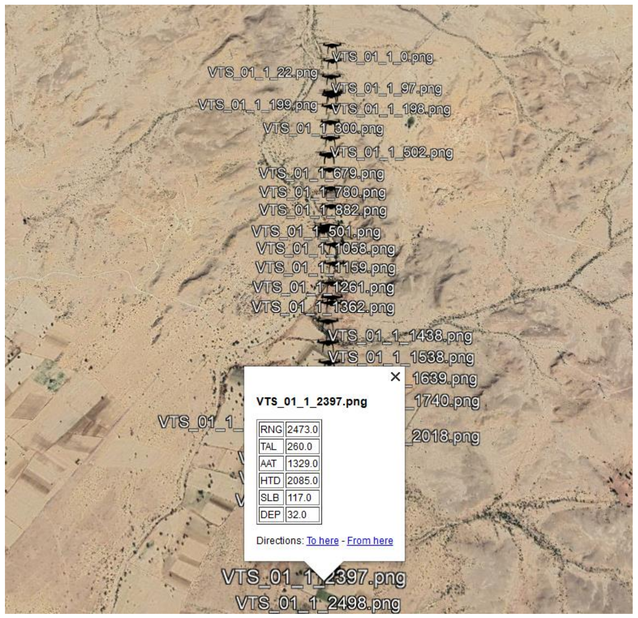

Figure 4: Path of the UAV over the real terrain

SUMMARY

The current deliverable has been tested on videos obtained from different platforms. The final output consists of a KML file, a CSV file containing the predicted labels and an SRT file which can be played along with the video. Thus, using the analog video captured by a UAV, this implementation helps in finding its geo-location, which contributes towards better airspace monitoring and management.

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