

Abstract

A geographical information system framework will be developed for highway maintenance and repairment. This framework, of high functionality and visualization, will be used by all administration, institution and person related to highway systems, in order to access, in 3D digital environment, to all kind of spatial, temporal and attribute information about all kind of items on/under/above/around highways, as well as to generate very complex spatial offline / online temporal visual and tabular queries and to create reports and maps under different level user privileges. The study is expected to create an efficient spatial data collection / storage / management approach of wide impact in its field, by its high functionality and by its structure that can shape / be used in all kind of administrative and executive processes related to highway management

Introduction

Problem

Due to its geographical location, Turkey is in the center of international highway transportation connecting Asia, Europe and Africa continents. Of 65000 km length transportation network, consist of state highways, province highways and motorways, Turkey's highways are planned, designed, constructed, maintained and operated by the General Directorate of Highways. Such a long network creates very complex managerial problems, difficult to track, control and solve, especially when vast variety of items, under/on/above/around the highways and attributes of them are considered. Hampering maintenance, repairment, control and inspection activities on highways, this complexity causes pecuniary losses and large damages to public resources, unless appropriate information technology and informatics are used in administrative processes.

Proposed Solution

Geographical Information Systems (GIS) with a structure storing, processing, analyzing and showing all kind of locational data provides a temporal and spatial flexible environment enclosing all highway elements, processes and variables, and make possible an efficient Highway System Management, provided that it is combined with well designed data collection system and high efficient data storing /dissemination infrastructure.

Literature summary

GIS has found large application area in many scientific research and development studies. Most of the uses in Turkey are as a scientific tool in researches; however, a recent desire arise to use it in administrative works.

Since the technology is still new and developing, since there is lack of experienced labor and since there is still some way to approach intellectual maturity in this field, limited numbers of GIS studies began to be constructed in the country are conducted mainly by means of private companies, resulting in basic level un-updated information systems with relatively high visualization but low functionality thus far from being usable in shaping administrative processes.

In this context, when the researches and studies in the world and Turkey are considered, only elementary level information systems providing basic level public information such as condition of traffic, location of bus stops, routes and schedules of motorways, save unspatial data bases and software packs, could be accessed. No geographical information systems that are cellular referenced and directly used in all works and procedures conducted and implemented by highways administrations could be reached.

Study Area

Study is first developed for the Muğla Akyaka highway which is the first 20 km of Muğla-Marmaris highway. At the second, stage, study will be developed for all roads of 26.th Regional Administration of the General Directory of Highways. According to success of the study , the system developed will be widen so as to encompass all of the roads of Turkey.

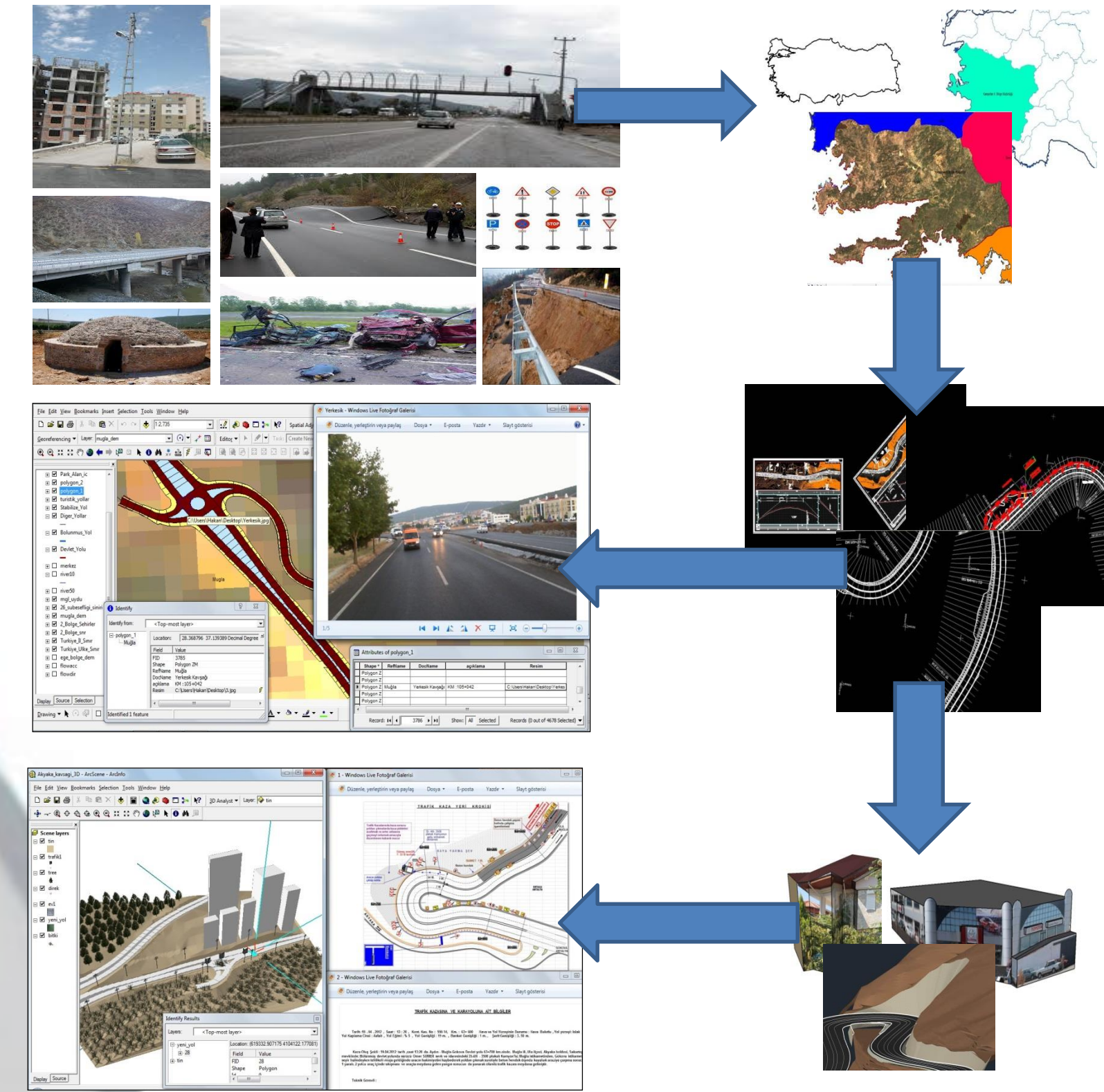
Methods

The methodology followed through the study can be given under three headings.

- Geographical Information System & Spatial/Attributal data base studies,
- Highway Observation Car (KaraGOZ) & Measuring/Computing Systems.
- Data Processing/Broadcasting station.

Geographical information system

A Geographical Information System infrastructure, through which 3D inquires can be implemented (about upper/lower road layers, all structures and facilities on/under/above/around highways, traffic signs, landscape works, traffic accidents, meteorological phenomena such as freezing, melting and flooding etc. and their attributes such as material, quantity, length, height, weight, person, photo, plan sketch etc.), is constructed utilizing an elaborately designed computer architecture based mainly on ArcGIS Server/Desktop utilities supported by a wide range of software systems.



Constitution of GIS model

Highway observation car (KaraGOZ)

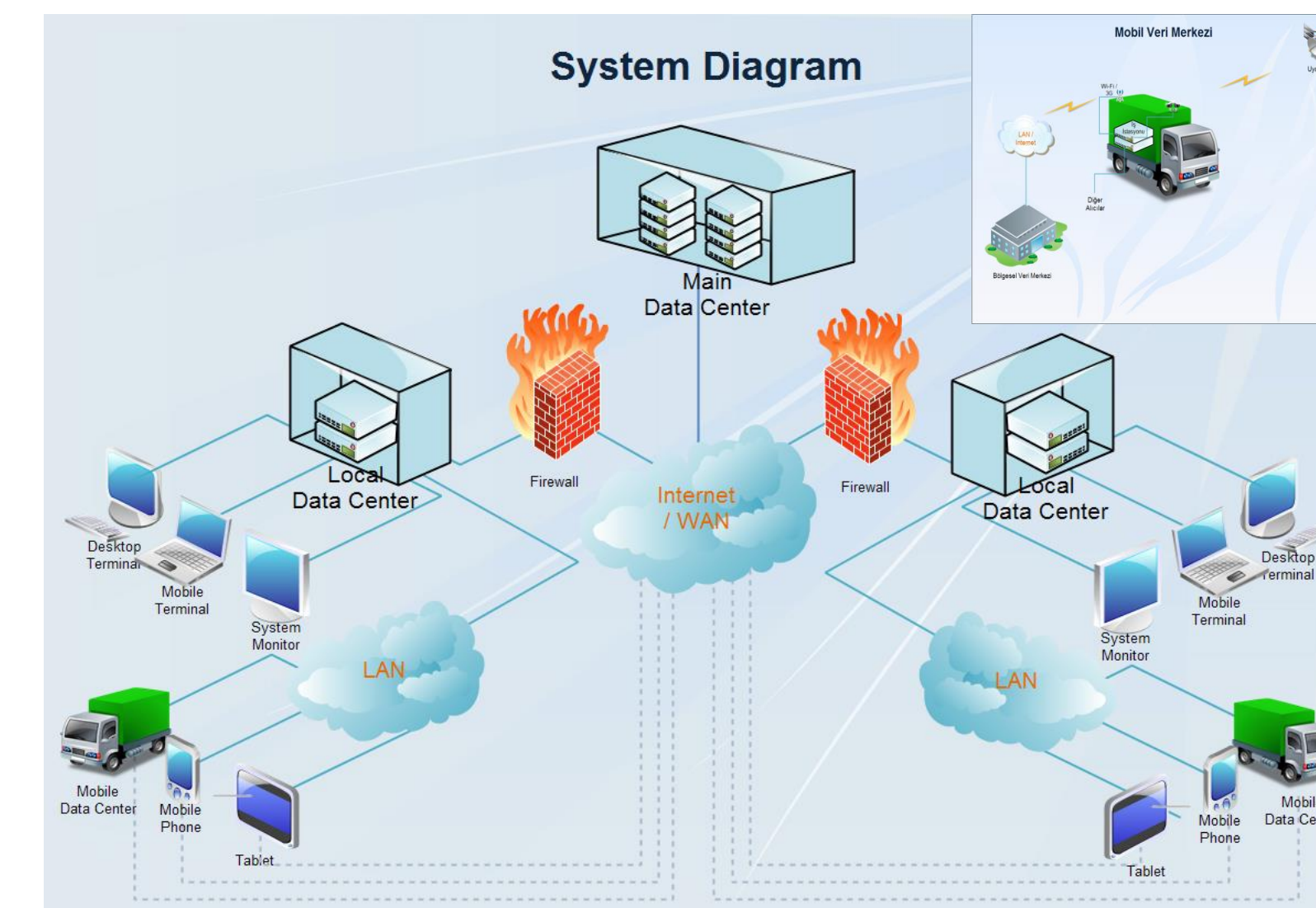
A highway observation car is designed to automatically collect geographical positions, heights and distance of all possible structures and facilities on/under/above/around highways, thus to extract the profile and route of highways, to take multidirectional-coordinate and time-based-images, to monitor the quality of travel and road, to store all the collected data and transfer them to the data processing/broadcasting station.



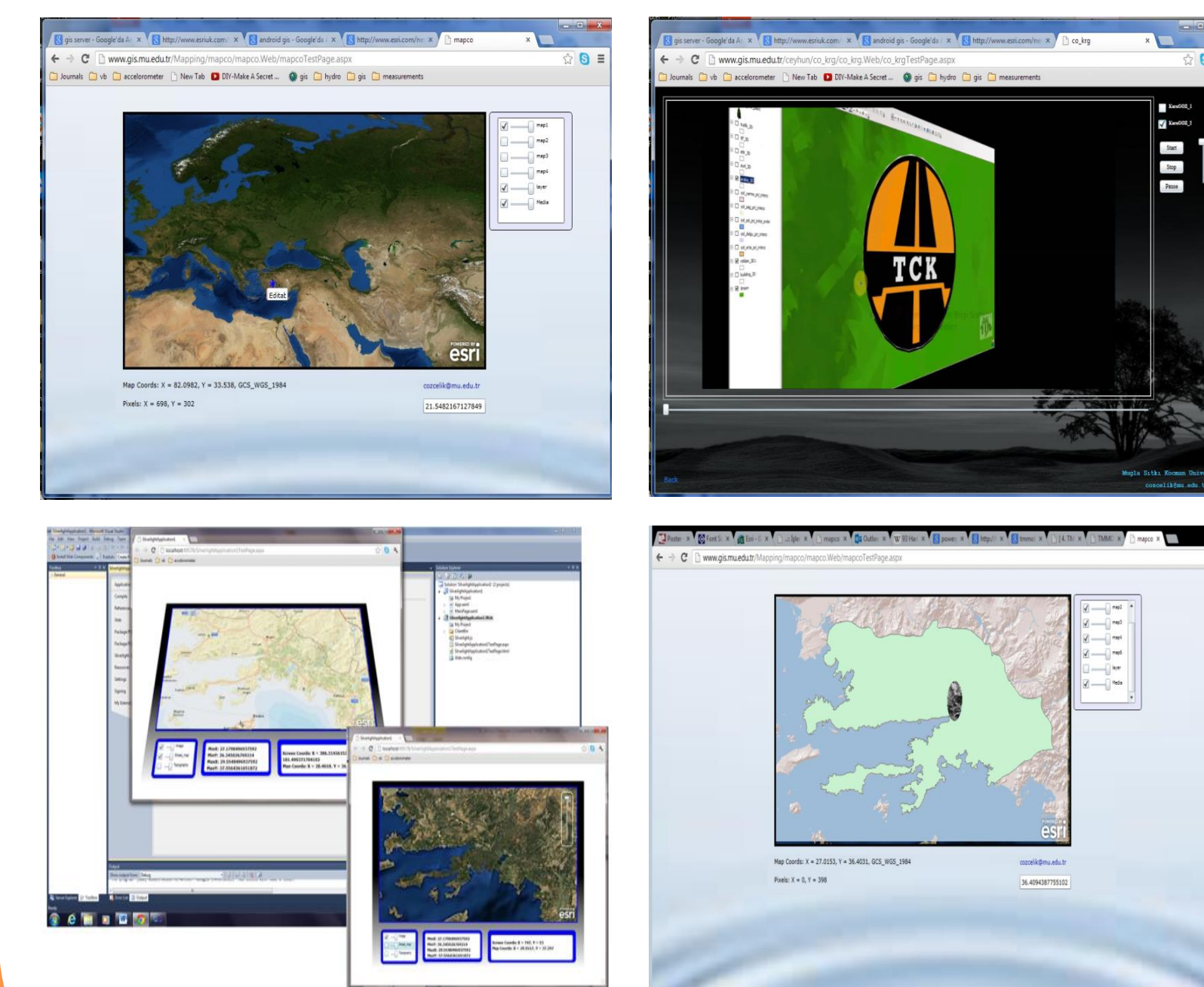
KaraGOZ

Data processing/broadcasting station

Data processing/broadcasting station is established to transfer collected data and measurements --obtained by KaraGOZ-- into online environment, to operate the created geographical information systems, to publish a project website, to provide a global web based inquiry environment for different user privilege levels.



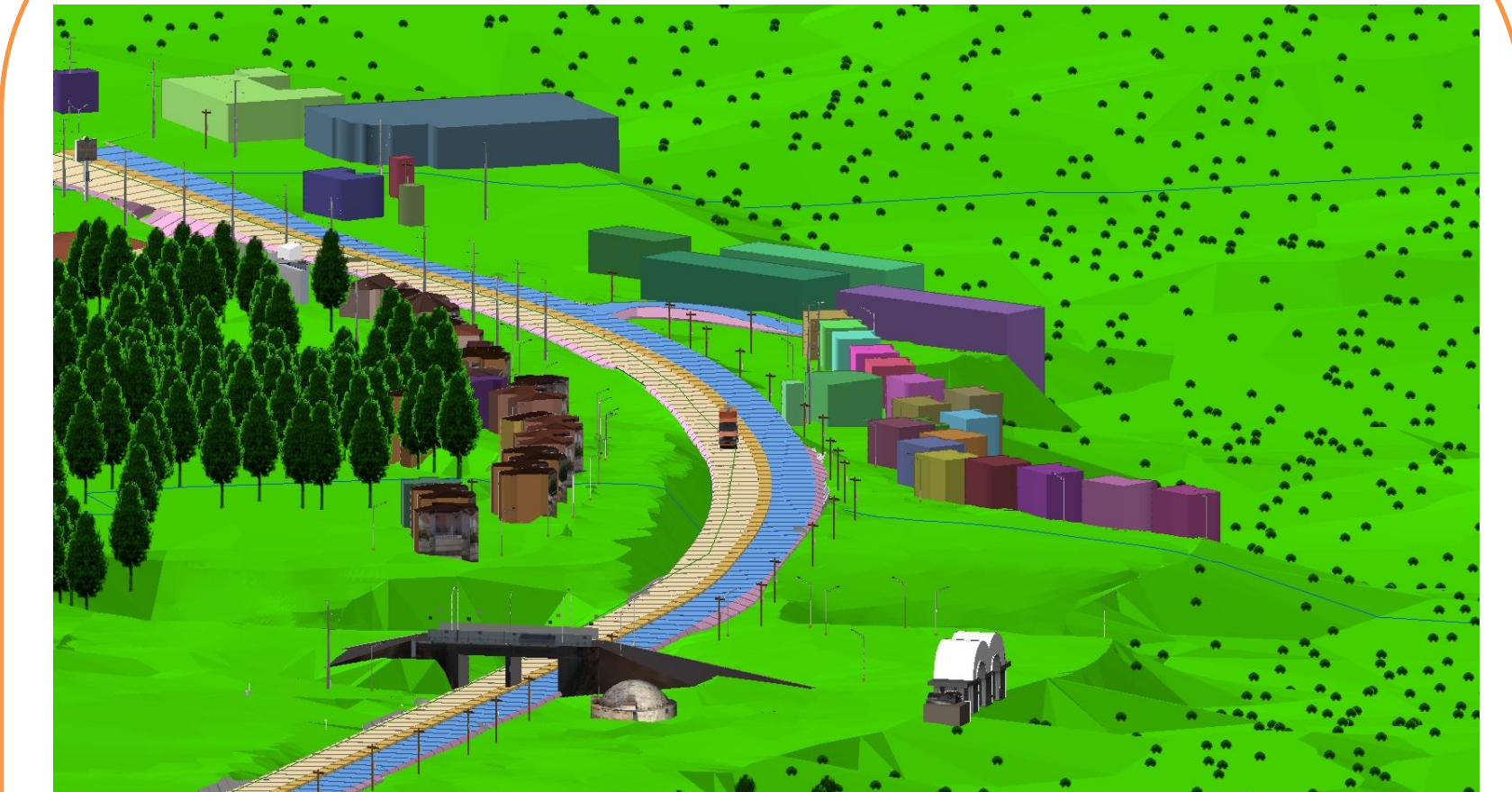
System diagram of Data processing/broadcasting station



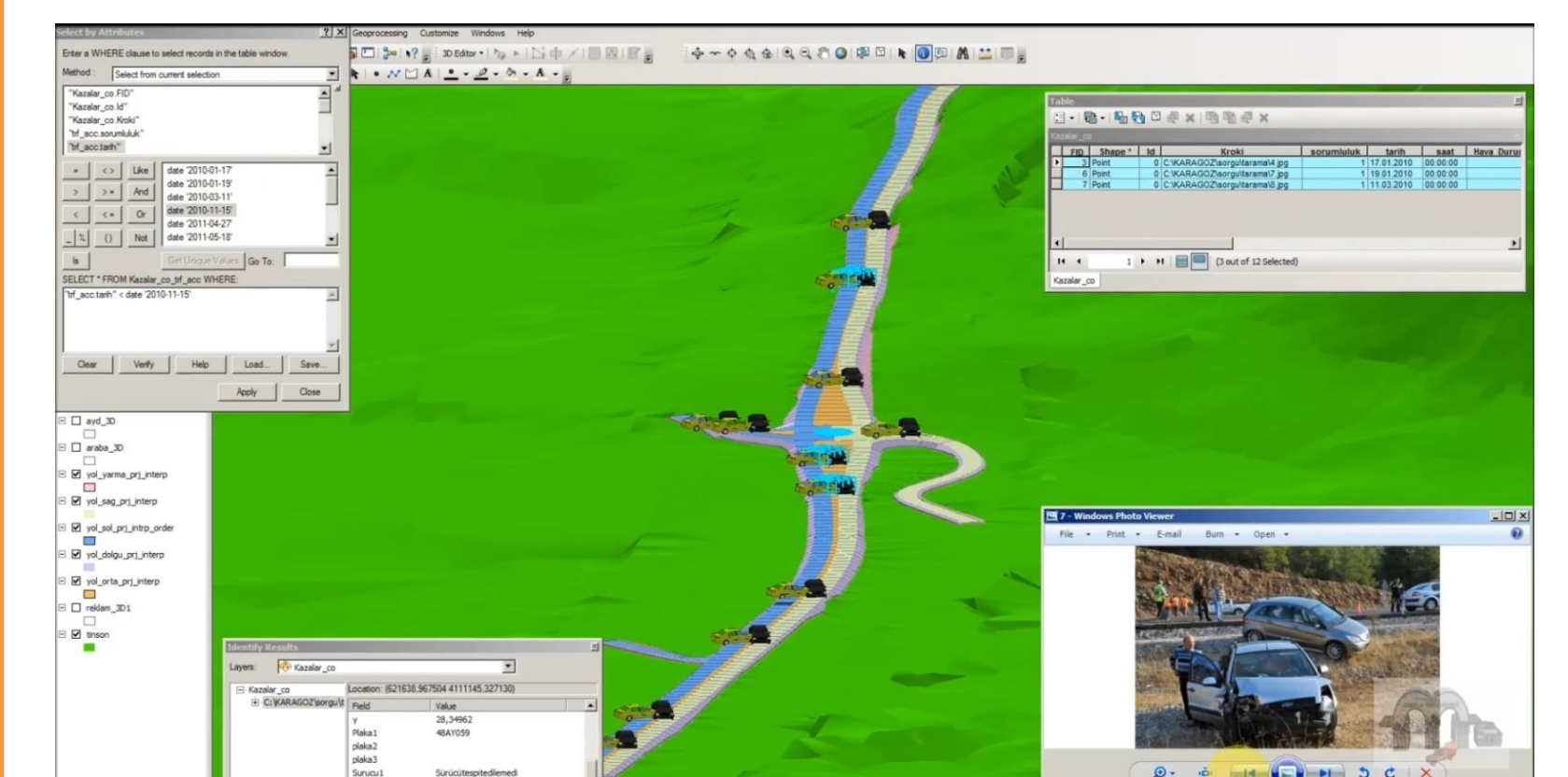
Map services, web processes

Conclusion

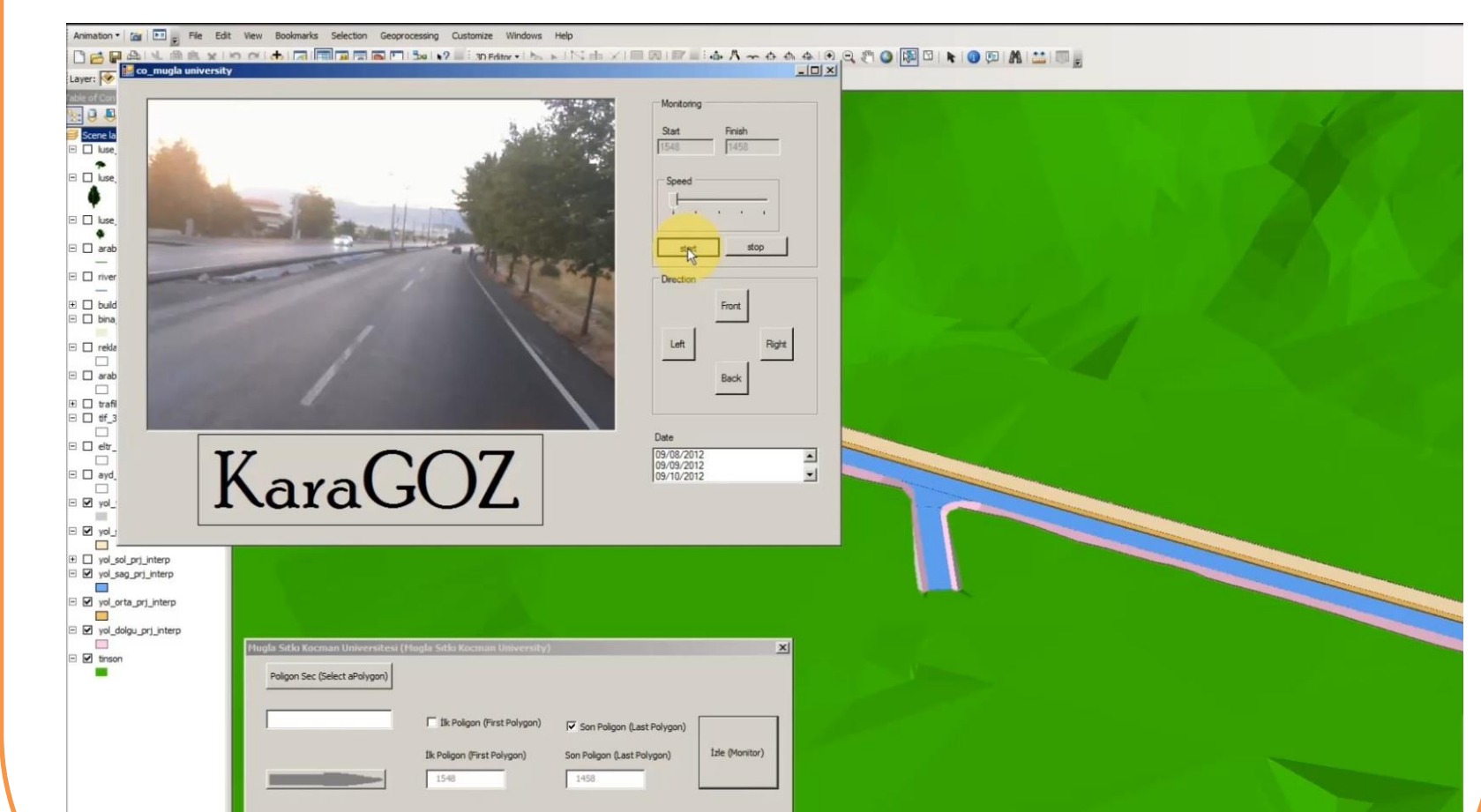
Preliminary results of the study have been obtained for Mugla-Akyaka Highway of 20 km length, with supports of "Muğla Sıtkı Koçman University" and "26 region of Directorate of State Highways". Capability and applicability of the system has been tested, to some extent, under limited financial abilities. The steps to be taken and ways to be followed to improve the system for whole the 26 th region are determined. Provided that adequate and continuous labor, equipment, devices and vehicle can be supplied, the project would be expected to create widespread impact with its model qualification and structure to be readily applied to all highway transportation networks.



3D GIS model



Spatial/tabular inquiries of car accidents



Stream visualization of roads for different date/directions

References

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Acknowledgments

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