Telemetry System for WRC Sport Cars. Mobile Part.

Hristo Nenov[1], Galina Hristova[2], Plamen Georgiev[3]

Abstract – **Nowadays, the success of the rally pilots depends on the quality of the notes of the co-driver. This is too subjective factor even for people with great experience. This paper shows an approach that supports the preparation of a strategy for the competition by reducing subjective factors and providing concrete solutions.**

Keywords – **Mobile technologies, Software, GPS, Models.**

I. INTRODUCTION

The using of technologies, as a tool, for problem solving is part of daily life. A similar approach is used in WRC Rally Championship. There, high cost equipment and facilities provide many details about the behaviour of racing cars. Necessity to optimize their driving can be done very efficiently by low priced technology. The system which is described in this paper is using a mobile phone like data-harvest module and server machine for data analysis.

II. ."FORCESPEEDO" SYSTEM BASED ON ANDROID MOBILE TECHNOLOGIES

A. Mobile Technologies

Mobile technology is the technology used for cellular communication. Mobile code division multiple access (CDMA) technology has evolved rapidly over the past few years [4].
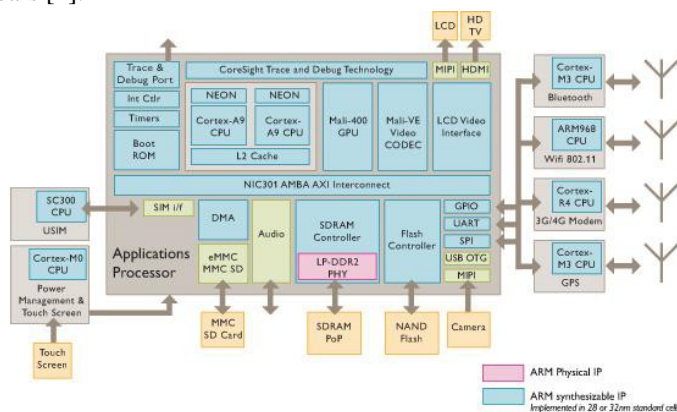

Fig.1 Mobile architecture from ARM [3]

[1]Hristo Nenov is with the Faculty of Automation and Computing at Technical University of Varna, 1 "Studentska" str. 9000, Bulgaria, E-mail: h.nenov@tu-varrna.bg.

[2]Galina Hristova, [3]Plamen Georgiev are with the Faculty of Automation and Computing at Technical University of Varna, 1 "Studentska" str. 9000, Bulgaria

Since the start of this millennium, a standard mobile device has gone from being no more than a simple two-way pager to being a device for data collection based on different sensors and tool for various calculation procedures. their use is mainly based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching and reverse pinching to manipulate on-screen objects. Internal hardware such as accelerometers, gyroscopes and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented. But, not only this. Combination of integration of such peripheral devices and the possibility of mobility gives programmers a great potential for creativity. From ordinary communication device it can be easily transform to intelligence tool for solving of interesting problems.

B. Android Operating System

Many types of mobile operating systems (OS) are available for smartphones, including: Android, BlackBerry OS, webOS, iOS, Symbian, Windows Mobile Professional (touch screen), Windows Mobile Standard (non-touch screen), and Bada. Android mobile operating system (OS) which is developed by Google, is the first completely open source mobile OS [1,2,4] and second (if not already the first) by popularity. These two characteristics were the reason Android to be chosen like platform for the telemetry system.

C. "ForceSpeedo" System

The performance of one rally car depends on sense of the driver and the quality of co-driver notes. Unfortunately, however good they are still remains a subjective factor.

The aim of the system is to improve the results of the rally pilot. This is based on several main processes:

- Data collecting in real time;
- Analyzing of the aggregated data into the server;
- Building the model of optimal performance.

Creation of etalon model based on objective factors and quantitative assessment, give possibility to evaluate the style and performance of the driver and to fix mistakes or to improve some details.

The system has two main modules – Android OS device which is in the car for data collection and remote server for final analysis of data and preparing the models of driving. The topic of the current paper is mobile part of the system.

The data which is necessary for the post analysis consist of a lot of coefficients and formulas. They are separated in two categories:

- statistic data from experiments;
- data collected from the car in real time.

The information from the car has connection with accelerating (throttle management), decelerating (brake management), the current speed of the car, lateral forces during cornering (G) and forces under braking / acceleration (G). The "G" forces are complex factor about speed characteristics and steering.

To collect the needed data the application use the information from peripheral devices (sensor) in mobile phone:

- GPS sensor;
- accelerometer ;

D. System Implementation

The interface of the mobile application includes speedometer for the current speed of the car, status of communication with the GPS sensor and information about "G" forces.

Fig. 2. "Speedometer" interface

The "map" display section shows a graphical presentation of the recorded data (data from GPS sensor) which describe the movement of the car.

Fig. 3. "Map" interface

Logs" display present recorded data as text. This is actually the information that will be sending to the server.
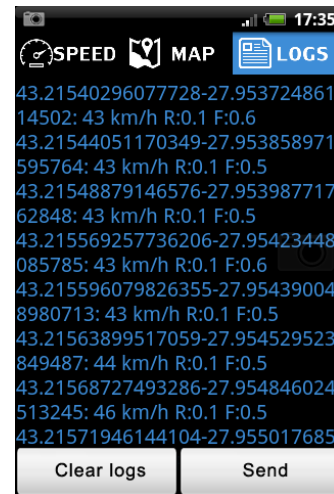

Fig.4. "Logs" interface

The role of different displays in mobile application is just to show that it works correctly. The main process is collecting of data.

When the user consider that that the process of data storing is finished , has possibility to send in to the server by Internet. Internet connection is only required when sending data to the server after the reading. At the time of reporting data is written to a local file and only needs a GPS connection. All reported data from the specified traverse route is sent to the server with the same key - date and time of transmission by which encapsulated and displayed together in the interface of the server side.

III. CONCLUSION

System for enhancing performance of rally driver in the race is Implemented and presented in this paper. The system is fully operational. After the tests, additional adjustments in the software and how to use the mobile device were made. Data received by it reached the required accuracy and are suitable for behavioral analysis and development of strategies for the different Stages in the race

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