

CHARACTERISTICS OF THE GPS-TRACKING SYSTEM LOGGATOR AND ITS APPLICATION IN ORIENTEERING EVENTS

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ABSTRACT

This paper discusses the characteristics and application of the GPS system Loggator in orienteering events. It is the first Bulgarian orienteering GPS tracking system, developed by the orienteering competitors Lachezar Iliev and Alexandar Dimitrov. The development of the system over a ten-year period 2013-2023 was followed and the technical parameters of its usage and coverage were analyzed. The research methods were interviews, observation, comparison and visualization of the data received from portable GPS-trackers and recorded in the system. The analysis revealed the collected and analyzed data was rapidly increased and widely used over its period of existence as an important condition for improving the quality and understanding of orienteering events, which made them appealing for media coverage and TV productions.

Keywords: orienteering events, gps-tracking, loggator system

ХАРАКТЕРИСТИКИ НА GPS СИСТЕМАТА ЗА СЛЕДЕНЕ LOGGATOR И ПРИЛОЖЕНИЕТО МУ В СЪБИТИЯ ПО ОРИЕНТИРАНЕ

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РЕЗЮМЕ

Развитието на GPS технологиите оказва огромно влияние върху спортовете с навигация. В статията се разглеждат характеристиките и приложението на GPS системата Loggator в състезания по ориентиране. Системата е българска разработка, създадена от състезателите по ориентиране Лъчезар Илиев и Александър Димитров. Проследено е развитието на системата за десетгодишен период 2013–2023 г. и са анализирани техническите параметри на нейното използване и покритие. Методите на изследването са интервю, наблюдение, сравнение и визуализация на данните, получени от преносими GPS-тракери, записани в системата. Анализът показва, че през периода на съществуване на системата събраните данни бързо се увеличават и се използват все повече от представители на различни държави, което е предпоставка и важно условие за подобряване на качеството на състезанията по ориентиране и медийното им отразяване.

Ключови думи: ориентиране, GPS проследяване, Loggator система

INTRODUCTION

GPS (Global Positioning System) technology has become increasingly popular in sports in recent years, as it allows coaches and athletes to receive valuable data on performance and training. Providing accurate location, GPS devices are also used for navigation and route guidance. These characteristics combine perfectly with the specific of the orienteering as a sport that involves navigating through unfamiliar terrain using a map and compass (Shandurkova, 2021).

The development of GPS technology began in the 1960s in USA. It was created as a satellite-based navigation system for military use. GPS technology became fully operational in the 1990s when a sufficient number of satellites to provide global coverage was reached. (Shopov, 2019). At the end of 20th century the GPS technology were integrated in various activities, including sport and orienteering (Shandurkova et al., 2008).

The first world championships with TV production and live GPS tracking was held in 2001 in Finland, but still was quite expensive, which limited the possibilities for its usage and analysis (Kocbach, 2011; Pedev et al., 2014). GPS watch devices that offer acceptable accuracy and specific software analysis were developed – Routegadget, FRWD, QuickRoute. After 2008 most of the elite orienteers began to use GPS devices for analysis. Live tracking GPS systems like TracTrac and GPSSeuranta for visualizing a group of competitors started to operate mainly in Nordic countries. This data was used to monitor progress, set goals, and plan training programs (Iliev, 2015).

GPS technologies in orienteering create new opportunities for analyzing the competition races, make real-time tracking of the competitors and contribute to the increased spectator interest and tv productions. Orienteering competitors have to take quick decisions about the best possible routes along the course, while running with high speed in an unknown terrain. To observe and to analyze the technical performance of the competitors is very difficult. (Sirakov, Belomazheva, 2019). The GPS devices and software products reveal many possibilities to follow and analyze the performance of the orienteer during competitions and trainings (Sirakov, Belomazheva, 2017). New disciplines in orienteering as urban sprint orienteering races are rapidly developed, which create new challenges for the GPS tracking systems (Sirakov, Ivanova, Belomazheva, 2023).

The first Bulgarian Tracking system Loggator, created by Lachezar Iliev and Alexander Dimitrov, was established in April 2012. The name of the system is derived from the Norwegian word *logg*, used for ship log and the Latin suffix – *ator*, which means a person or object that performs a certain action, i.e. *loggator* is a log of the actions performed by the athlete. The main feature of the Loggator system is the accurate tracking of moving objects in real time. The

product combines hardware and software designed for a wide range of users providing the opportunity to compare the location and mode of movement of selected GPS devices (Figure 1). The system is divided into two parts, where the software is the visualization of the received data from the hardware. The transmission of this data is done through the GSM network, which the software processes and displays all data on the Internet (Iliev, 2015).

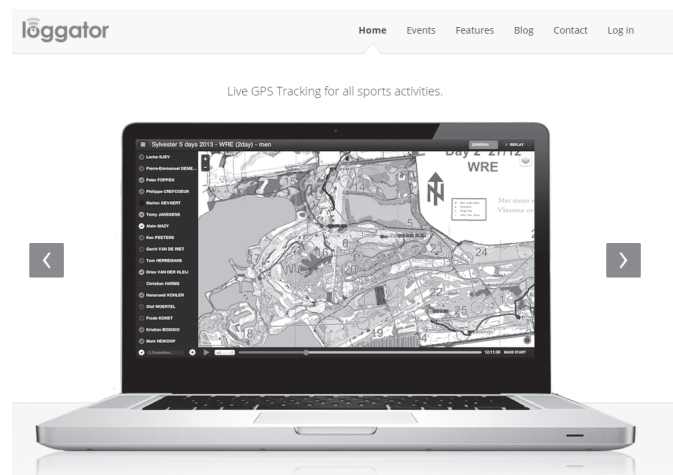


Figure 1. General view of Loggator system (<https://www.loggator.com/>)

The aim of the study was to analyze the development of the Loggator GPS tracking system in 2013-2023 period.

The tasks of the research were:

1. To characterize the parameters of the Loggator system.
2. To summarize the data, recorded in the system.

METHODS

The research methods were interviews with the owners of Loggator, observation, comparison and visualization of the data received from portable GPS-trackers and recorded in the system.

Administration was made by login in the Loggator system with name and password, entering the name of the GPS tracking device, start and end date and time, opening date and time on the Internet, recording the category of the competition, the location and choosing between public or hidden tracking. Placing own map, if necessary, or open street map by default.

RESULTS

The records of the live tracking of the Loggator system began in 2013. Since then 9050 events are recorded, constantly increasing from 27 in 2013 to 1514 in 2023. (Figure 2).

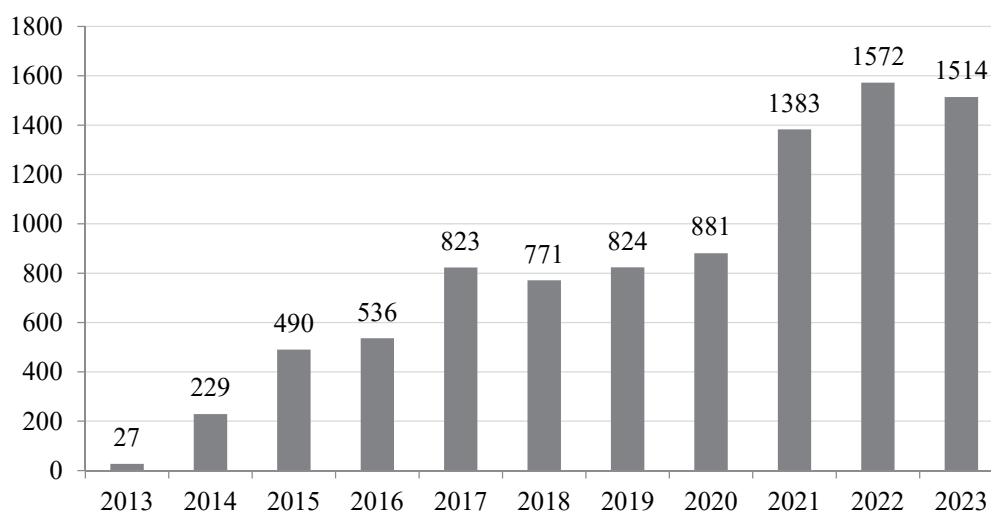


Figure 2. Recorded events in the system (2013-2023), until 15.11.2023

The portable GPS devices, called trackers, were designed to connect with the servers of the Loggator system. Their settings were set to send location, the server via cable or remotely by sms. 1253 Loggator GPS tracking devices were used since the beginning of 2013. 1183 are still in use, 70 are lost or damaged. Different formats of the orienteering events required different settings of the devices. In December 2020 several Scandinavian countries and Switzerland stopped the 2G mobile network and new GPS trackers were developed (Figure 3, right).

The GPS devices used in Loggator were capable of recording and transmitting data at different time intervals, storing the data in buffer units in the absence of a GSM network, their batteries last between 10-48 hours of operation and were waterproof.



Figure 3. GPS trackers, compatible with 2G – left and 4G and 5G-right

This Bulgarian tracking system was used from more than 95 registered users from 22 countries in Europe (Figure 4, marked in dark grey) and New Zealand. The provided valuable data is used by the national teams of Bulgaria, Norway, Austria, Italy, Spain and France.



Figure 4. Loggator system coverage in European countries until 15.11.2023

The most visited event in the system was the junior world orienteering championships (JWOC) in 2023 with more than 50000 visitors (Figure 5), with an average of 15.07min on site.

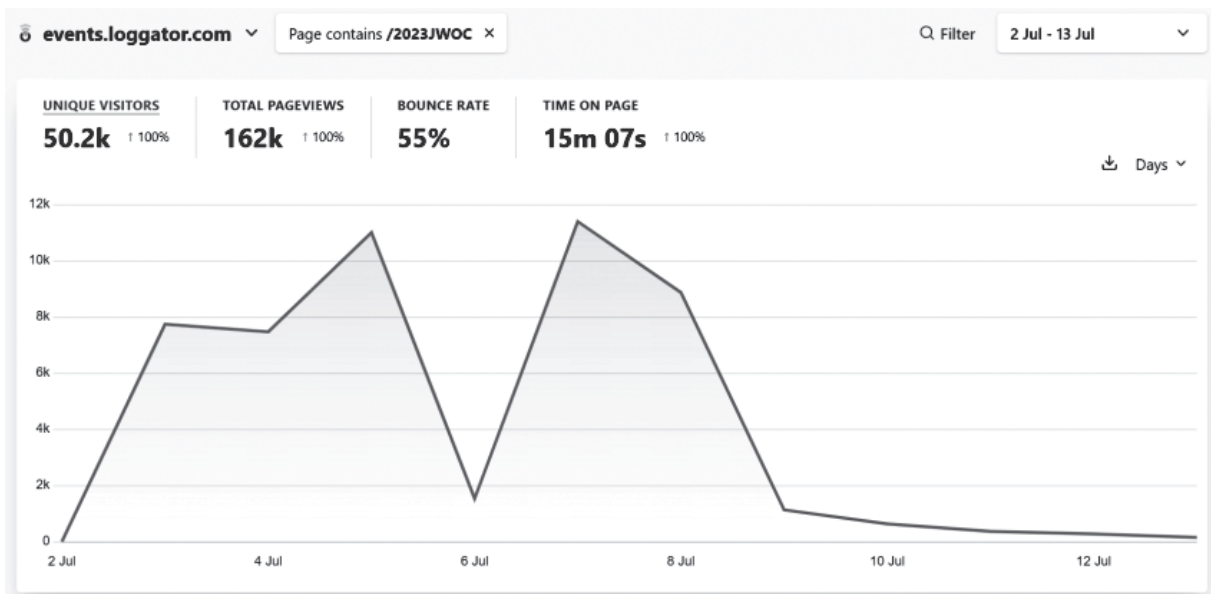


Figure 5. Loggator visitors at JWOC'23

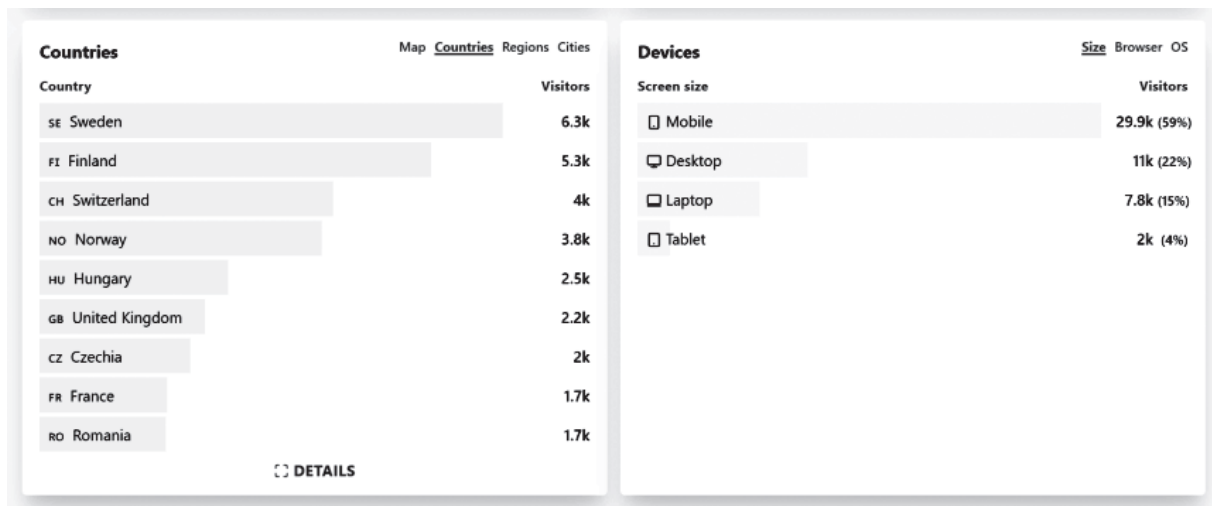


Figure 6. *Distribution of visitors from different countries and devices used at JWOC'23*

The data was stored on cloud servers.

DISCUSSION

The Loggator systems provided excellent visualization and analysis possibilities of the orienteering events. A new interface was developed to synchronize the tracking with video recordings. Improvements intended to include semi-automatic correction of the route trajectory of the sprint events, where the city buildings influence the GPS signal. A new integration of all the users of a certain event is planned in the future.

CONCLUSION

The Loggator system developed rapidly during the 10 year period of its existence. The use of live GPS tracking is widely spread in different countries. An information base of the conducted tracking is preserved and is available at any time for review, and comparison in Loggator system. The application of the Loggator system allows an accurate and objective quantitative analysis of the movement of the competitors.

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