

# Visual Signal Device (VSD) for Deaf Sports Athletics Malaysia

Nur Amira Zulkifli<sup>1</sup>, Kamaruzaman Soeed<sup>1,6</sup>, Izwyn Zulkapri<sup>1,6</sup>, Azli Yahya<sup>1</sup>, Muhammad Iqbal Tariq Bin Idris<sup>2,6</sup>, Fatin Aliah Phang<sup>3,4</sup>, Nina Diana Nawi<sup>3,4</sup>, Siti Zarina Mohd Muji<sup>5</sup>, Jamil Abedalrahim Jamil Alsayaydeh<sup>9</sup>, Zulkipli Ghazali<sup>7</sup>, Mohd Yazid Bain<sup>8</sup>, Jaysuman Puspanathan<sup>1,6</sup>

<sup>1</sup>School of Biomedical Engineering & Health Sciences, Faculty of Engineering, Universiti Teknologi Malaysia.

<sup>2</sup>School of Computing, Faculty of Engineering, Universiti Teknologi Malaysia

<sup>3</sup>Engineering Education (CEE), Universiti Teknologi Malaysia

<sup>4</sup>School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia

<sup>5</sup>Instrumentation, Sensor & Tomography Research Group (InSet), Faculty of Electrical & Electronic Engineering, Universiti Tun Hussein Onn Malaysia

<sup>6</sup>Sports Innovation & Technology Centre, Universiti Teknologi Malaysia

<sup>7</sup>Innotex System Corporation Sdn Bhd, Selangor Malaysia.

<sup>8</sup>Malaysian Deaf Sports Association (MSdeaf), Wilayah Persekutuan Kuala Lumpur

<sup>9</sup>Centre for Advance Computing Technology, Universiti Teknikal Malaysia, Melaka, Malaysia

Corresponding author email: jaysuman@utm.my

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## Abstract:

Previous study revealed that the advancement of technology has widen the potential for all individual including the disable to participate in any sport competition. Deaflympic and Malaysia Deaf Games, SOPMA respectively provide the opportunity for the deaf people to compete in sports event internationally and locally. From the literature, it is shown that deaf individuals have some visual-spatial advantages relative to hearing individuals. Hence, in this study, Visual Signal Device (VSD) being developed as a sight-based visual starting system for deaf sports athletes in track and field event. VSD system consist of a RGB LED panel, controller and the SEIKO brand electronic gun. The VSD system were explored to see its effectiveness during the sports for deaf people. The results show that, VSD successfully employed during the recent SOPMA 2018 in Perak, Malaysia

Keywords: Visual Signal Device; Deafness; Deaflympic; Technology innovation; Sports, SOPMA

## 1. Introduction

Paralympic is sport where it gathers all disabled people to play sport. This sport was held by International Paralympic Committee in 1954. It has been introduced by Sir Luqwig Guttmann. Once, Paralympic games is known as Stoke Mandeville Games which is the first games for wheelchair athletes. In 1924, International Olympic Committee (IOC) has introduce sport for deaf people. Deaflympic is the name for the event and it also known as World Games for the Deaf in 1924 [1].

Deafness refer to people who cannot hear sound with certain frequency. For an adult, if they cannot hear sound with 40 Hz frequency and above they are classified deaf while for children is 30 Hz and above [2]. Due to the difference frequency as stated in table 1, some of deaf people has different ability in hearing. For instance, if the hearing loss is extreme they have severe hearing loss. Thus, the degree of deafness of someone depends on the limitation of sound frequency that they can hear. Table 1 shows the frequency range of sound deaf people can hear [3 ,4].

**Table 1** Degree of Hearing Loss [1]

Degree of Deafness	Hearing Loss (Range)
Mild	26-40 dB
Moderate	41-60 dB
Severe	61-80 dB

Study by Proksch [2] revealed that auditory deprivation leads to compensatory changes within the visual system that enhance attentional processing of the peripheral visual field. This also highlighted Stivalet [3] that in a visual task selectively supported by central vision, visual processes of the congenitally deaf are more efficient when the task involves

the contribution of serial processes. By using disclosed signaling system, for example, a lane specific visible indication to begin a race is believed advantageous over an audible start signal, particularly for athletes who are hearing impaired. [4]. Since, the deaf people have high visual perception skills and they can easily interpret things through their visual; hence, the study on visual system can be used by sport management team to manage Paralympic for deaf sport.

## 2. Background Problem

Track and field sports technology is rapidly advancing [5,6], along with the advancement of technology [7]. Track and field differs from most other sports because it is solely measured in meters and seconds. A fraction of a second can make all the difference in track. Because of that, the technology that records data from track and field races must be as precise and accurate as possible. Technology involved in track and field ranges from personal gear, to equipment for track events, to the technology in the track, itself. Particularly for track events such as 100 m, 200 m, 400 m and relay sprinting discipline such as 4x100 m and 4x400 m, a starting pistol using empty bullets is commonly use. The sound of a gunshot will signal the athletes to take off from the starting line of the race. In 2012 [8], the electronic starter pistol [6] employed to improve the start of track events. This model imitates the standard pistol used in track events. Where it differs, is when the trigger is pulled. Rather than working like a standard pistol, this one transmits a signal that results in the sound of a gunshot being played over a loudspeaker at the starting line of the race. In order to simulate the standard pistol, smoke is emitted from the electronic one. Also, a light flash from the electronic pistol to complete the simulation and start the race time. Runners are not the only track athletes benefitting from new technology [9]. Neither of the mentioned gunshot method is suitable for deaf athletes due to hearing problem. To address this issue, referees uses flags or basic gesturing such as waving as alternative to the gunshot. Consequently, performance of athlete has been decline ever since this method is used. This research introduced a sight-based visual starting system to address the problem faced by deaf athletes.

## 3. Malaysia Deaf Games (SOPMA)

Malaysia Deaf Games, SOPMA [10] is multi-sporting event competition dedicated to the deaf in Malaysia. SOPMA has been around since 1985 under the name of the Deaf Inter-Club Sports Championship (KSAKP). Its held once every two years and is the most important and popular deaf sport because through SOPMA talented deaf athletes will be selected to represent Malaysia in international deaf sports such as the Asia Pacific Deaf Games and the Deaflympic Games. The event of SOPMA were run for six-day games where all 14 states will be participated in the games to compete in four sports events: Athletics, Bowling, Badminton and Football. Each state will take a turn to host the next Games and usually 60-2500 athletes and officers will be participated in SOPMA [11]. In 2018, SOPMA was held in Ipoh, Perak. Total deaf athlete participates in the sports for deaf competition since 1985 is 8605 persons [10].



**Figure 1:** The athlete participated in the track event during SOPMA 2018. [12]

## 4. Visual Signal Device (VSD)

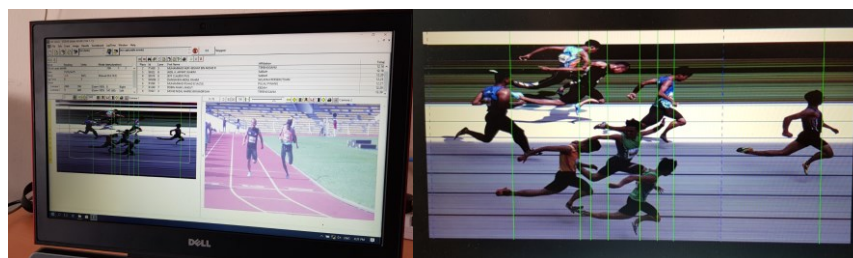
Visual signal device (VSD) is being developed as a sight-based visual starting system for deaf sports athletes in track and field event. The VSD system consist of a RGB LED panel which will illuminate red color ('on your mark'), blue color ('Ready') and green color ('Go'). The LED panel can be wireless or wired with the button controller. The controller is then synchronized and connected with the SEIKO brand electronic gun. Once the gun is triggered, the green light will be switch ON. This will immediately trigger the SEIKO photo-finish system to begin the timing for all athletes as they take off from the starting line. The whole hardware system is shown as in Figure 2.



**Figure 2:** Visual signal device hardware system

## 5. Results and Discussion

The VSD prototype system has been successfully employed during the recent Sukan Orang Pekak Malaysia (SOPMA) 2018 in Perak, Malaysia. For the first time in the history of the national deaf sports event, the conventional flag waving and gestures for all track events such as 100 m, 200 m, 400 m, 4 x 100 m, 4 x 400 m, 800 m and 1500 m has been replaced with the VSD system. The VSD system is designed to be synchronized with SEIKO photo finish system which is operated by Innotex Corporation Sdn Bhd. Figure 3 shows the result of a photo finish sample.



**Figure 3:** SEIKO photo finish system with VSD synchronization

The VSD controller unit is placed at the jury stand and triggered by an electronic gun. The timing system and the green light of the VSD system has successfully trigger simultaneously without any error. The VSD is currently at prototype stage and will be further improvise before commercialization.

## 4. Conclusion

A visual signal device (VSD) has been successfully developed as an alternative approach to replace the conventional gunshot which is being commonly used to start-trigger the track and field events. The VSD system is designed to synchronize with SEIKO photo finish system and has been proven successfully functioning well. This VSD system has been employed in the recent SOPMA 2018 and will be further improvise for commercialization

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