WSN BASED SMART ADVERTISEMENT IN INTELLIGENT TRANSPORTATION SYSTEM USING RASPBERRY PI

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ABSTRACT

In this current era of technology, Intelligent Transportation Systems (ITS) are helping different cities around the globe to becoming smart cities, while advertisements always played a vital role in any product's sale ratio. Besides security, transportation data, and traffic management, the field of advertisement through (ITS) still needs attention for researchers. According to current literature, a huge amount of budget has been invested in the field of advertisement as well as numerous deaths are caused due to roadside billboards. In this paper, we have developed a system which helps to advertise content digitally on LEDs installed on vehicles by incorporating Raspberry Pi. In results, an advertisement can be remotely controlled from the client's mobile phone and Raspberry Pi will act as a server which collects, manage and displays ads digitally. This system is a good addition towards low cost, efficient and user–friendly solutions.

KEYWORDS

Intelligent Transportation System, Smart Cities, WSN, Client–Server Architecture, Raspberry Pi, GPRS.

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1. INTRODUCTION

In this era of technology, the development of new internet–based business models provides too much importance to the Web in the market economy. The most successful and profitable among those is the online advertisement. The online advertisement which is also known as Internet Advertisement (IA), it provides the end user promotional contents through the internet. The ratio of revenue coming from IA only in the United States in the year of 2013, surpassed the cable television and broadcast television was nearly exceeded (Aksu, Babun, Conti, Tolomei & Uluagac, 2018). Plus, in 2016, almost 200 billion dollars revenue was generated through internet advertisement world widely (eMarketer, 2017) and it can reach 335 billion dollars by the end of the year 2020 (eMarketer, 2016). More Generally, IA business will ultimately broaden to pervasive and ubiquitous smart devices which are interconnected with each other, they are collectively known as the Internet of Things (IoT). Various related work and applications are discussed in (Sharma & Tiwari, 2016), one of those is in Dogo, Akogbe, Folorunso, Maliki and Akindele (2014), where researchers presented the development and design of their electronic strolling message display board which was a microcontroller based application, which displays the information and messages in real–time via SMS. The implementation and utilization of this application were presented in public utility places, educational institutes and in advertisements. A novel approach is used in Reddy (2013) for intimating messages to the peoples using GSM technology which is synchronized with the wireless electronic display board. This approach omits the old traditional way of message pasting on the board by just sending a message immediately without any delay. This approach can also be used in big buildings, hotels and shopping malls to enhance the security systems by providing awareness of emergency situations which may avoid many dangers. The concept of ITS is discussed in Bhosale and Khan (2016), where researchers tried to understand the IoT and its feasibility in the bus transportation system of Singapore. Technically, Singapore is very advanced but still needs improvement in its transportation system's advancement. By the usage of IoT, they made a system for the user which evaluates and understands effectively various bus options.

In the IoT world, enabling computational advertising is an under–investigated area for researchers; however, many interesting challenges and opportunities can be found in it. Indeed, the traditional internet advertisement can be enhanced through IoT advertisement by the help of three key features of IoT (Chen, Cox, Uluagac & Copeland, 2016): high connectivity, high diversity, and scalability. As we know that, due to the high amount of new smart devices are connecting and leaving IoT network constantly, IoT high connectivity and accurate scalability play a vital role to perform an advertisement in a really dynamic environment. Furthermore, complex advertising strategies which consider context awareness as their fundamental component is handled by IoT device high diversity. For example, customized advertisements from roadside digital billboards can be provided to the car driver based on his interests or habits (e.g. preferred hotels, restaurants, and nearby shopping locations). Finally, the difference can be seen between traditional web–browser based ads, where during whole day very limited and rare user interaction occurs, and IoT ads in which users are interacting with IoT environment almost 24 hours a day.

The rest of the paper is organized as follows: In section 2, the proposed methodology for current research is discussed. While results are shown in section 3 and in last, section 4 concludes the research study.

2. PROPOSED METHODOLOGY

In recent years, automakers putting their efforts to adorn the vehicles with a set of computational devices and sensors, and in the IoT industry, smart connected vehicles are considered as one of the most dominant trends. Millions of smart vehicles are possibly carrying multiple passengers around us. We cannot consider further an automobile just a mechanical machine which people always use to travel from point Y to point Z. When comparatively they are mobile, complex nodes, and interconnected establishing distributed and dynamic computing systems. These elements open up new chances for researchers and developers to create novel services and applications. Advertisers can find easily their interesting

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"targets" during passengers are travelling on board through those smart vehicles. Hence, in this paper, we focused to utilize IA by integrating it with the mobile phones to generate and publish ads. Hence, proposed methodology has been divided into 4 stages as shown in Figure 1, 1) Uploading Customized Ads, 2) Ads Verification and Legalization through Admin Panel, 3) Incorporating with Raspberry Pi, 4) Publishing Ads.

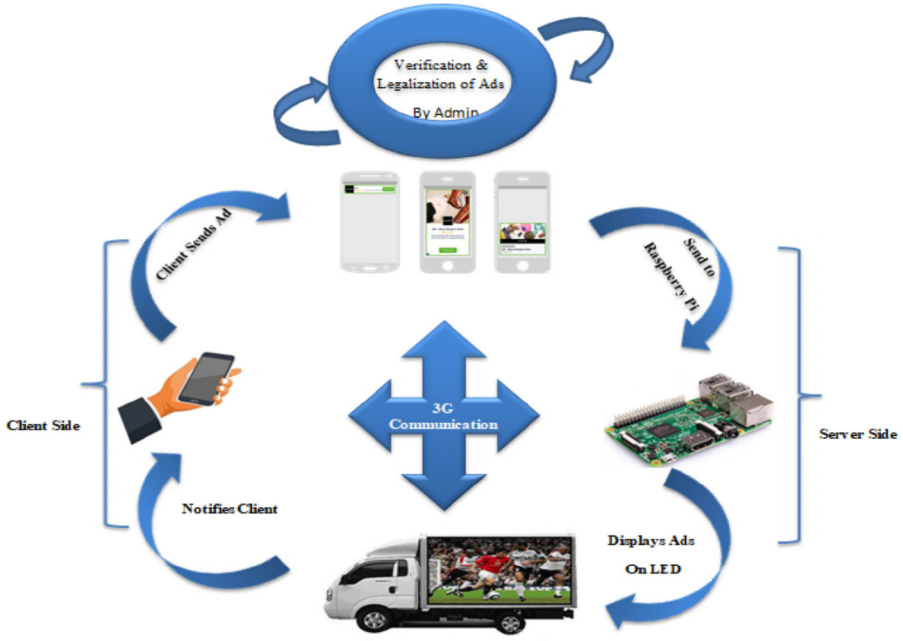

Figure 1. Proposed System Flow Diagram.

2.1. UPLOADING CUSTOMIZED ADS

The first phase is dedicated to client–side; in this section, the user/client will upload his/her own customize ads in the form of images or videos through the android application. Only the following images formats are supported to be uploaded: *jpeg, png, gif, tiff,* while for videos our designed application only supports *.mp4* format (University of Michigan Library, 2019).

2.2. ADS VERIFICATION LEGALIZATION THROUGH ADMIN PANEL

This phase of research cycle deeply focuses to avoid any irrelevant, anti–state, anti–religious, and sexual content to be published on L.E.D according to the electronic media code of conduct–2015. For this purpose, an admin is assigned to verify and validate the ads properly through the application and only after the approval of admin ad/ads can be forward to the server side processing. This process can be repeated for any particular client due to any amendments in the content.

2.3. INCORPORATING WITH RASPBERRY PI

After the verification and legalization process, integration between designed android application with Raspberry Pi will occur. During this process, the medium of communication which is used is 3G services.

2.4. PROPOSED METHODOLOGY

In the end, Advertisements will be published on the L.E.D installed on the smart vehicle. The reason for choosing smart vehicles is to avoid old approaches like billboards, walls, static poster etc. Furthermore, a moving vehicle can deliver ads more efficiently across the city, or city to city. This process will improve the promotion rate of content as well as the satisfaction of the client.

3. EXPERIMENTAL RESULTS AND DISCUSSIONS

Firstly, users have to login him/her self after opening the application as shown in Figure 2, if a user doesn't have an account then he may create first through signup functionality. After logging, the user can upload his desired ad as shown in Figure 3. Each Ad will be uploaded and will be saved separately into the database with a unique Ad_ID.

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Figure 2. User Login and SignUp Panel Screen.

Figure 3. Advertisement Uploading Screen.

After uploading process, the admin will make sure each ad and its contents. If an ad is improper, the admin will disapprove it as shown in Figure 4. In results, a notification will be generated for modification in that particular ad to the client/ user.

Figure 4. Varification and Legalization Screen.

Moreover, in case of approval by the admin, it will be forward to the Raspberry Pi and be displayed on L.E.D screen as shown in Figure 5.

Figure 5. Smart Vehicle Advertisement on L.E.D Screen.

4. CONCLUSION

Internet Advertisement worths billions of dollars and growing rapidly in the current era, while the integration of IA with ITS needs further attention from researchers. In this research, we focused to introduce a novel architecture of an IoT advertisement which improves the implementation of ITS in smart cities.

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We expect that this work can impact researchers on this topic, as well as on the new product's development on the industrial scale. For future work, we will try to make proposed application hybrid; for e.g will develop for IOS users as well to remove platform barrier. Furthermore, in our future research, we will target different mediums of vehicles like (motorbikes, heavy trucks and cars) which could help us to increase the usability of this framework to be adopted.

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