

Consumer Interest Tracking and Data Acquisition System

Rahul.G¹, Vaseem Khan.B¹, Joshua James¹, Alka Yadav¹, Natya.S²

¹B.E Student, ECE Department, M S Engineering College, Bangalore

²Assistant Professor, ECE Department, M S Engineering College, Bangalore

ABSTRACT- In the modern world, growth is a factor every company seeks for, And Growth is determined by the amount of revenue they generate, the number of consumers they satisfy etc. For product based companies, achieving Greater number of sales is their key objective. And it achieved by understanding customers' requirements, employing various marketing strategy, carrying out relevant analysis, advertisement etc., and all of these factors pose a great challenge for every enterprise and companies around the world, but foremost understanding the customers interest is the greatest challenge of all. Every time we step into a mall or Exhibition, It is the natural tendency of a person to spend more time with the object that meets their interest, but till now we have never kept the track of the interaction between the consumers and product with respect to time. In our project, with the help of wireless communication & ubiquitous sensors such as RFID and proper GUI, we are developing a consumer interest tracking device which is capable of gathering valuable information regarding time spent by an individual at various stores, Products in an exhibition or shopping mall. Based on the information collected we determine the interest of consumer, which in turn help the company to manufacture better products, take smarter decisions and ensure a safer future for the enterprise. The information gathered is made available for real-time monitoring, or can be stored for future analysis

KEYWORDS - Real-time monitoring system, consumer tracking device, marketing strategy analysis, shopping preferences

I. INTRODUCTION

Consumer Interest is one of the massively studied topic by researchers and marketers in the past, and is still under study, Understanding of consumer interest can have direct impact on the overall performance of the business, With the advancement in technology various marketing techniques have been developed and this has led us to find new and innovative idea to market our products. Generally, marketing is done to the general audience during general hours. But the key to success is to market at the right time and to the right audience. Several location-based services have been designed and developed to provide advertisement information at the right place and right time but very less research and development is done for the right person and the right product, our project is a step towards this approach. Various persons visit mall every day, some do shopping and some do window shopping. Some go for food and some will go for fun with variety of consumer in the mall it is difficult to guess which product is in demand, what consumers are looking for, are they satisfied with mall Services or not, is food court good enough to hold consumers for long all these questions are not answered and mystery for the mall manager. Generally information such as, consumer mall visiting pattern; time spent at the food court or various stores, what is consumer likes or dislikes, etc. are not kept track off. Figure1 shows the Customer Shopping Behavior. Three Rs which are Research, Recommendations, and

Returns may hold the key to understanding consumers.

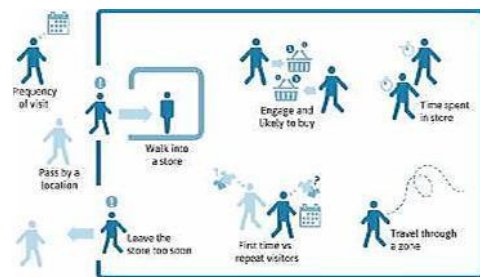


Fig.1: Customer Shopping Behavior

With the help of low cost and low range wireless communication, we can design a smart consumer interest tracking system. The system will be divided into three parts the tracker part which consumer will carry once he enters the mall, part which will be installed at various

places of them all, like stores or restaurant. And the main control part where all information will be collected and stored. With above wireless system, we will be able to gather consumer visiting pattern and time spent at various stores, this will help mall manager to manage the mall in more efficient way and allow him/her to do proper and more efficient business.

CIAS optimizes marketing campaigns and advertisement strategies to increase customer responses and satisfaction Prediction is booming. It reinvents industries and runs the world. Predicting human behavior combats risk, boosts sales fortifies healthcare, streamlines manufacturing, conquers spam, optimizes social networks, toughens crime fighting, and wins elections. CIAS technology helps computer literally learn from data and predict the shopping behavior of individuals. Perfect prediction is not possible, but the analysis of the acquired data helps the company take smarter decision enabling a safer future

II. SYSTEM COMPONENTS

This section discusses the basic theory of components used for this work. Though, we will be more focused on the heart of the system design and its peripherals while we leave other basic electronic components

1. HARDWARECOMPONENTS.

1. Microcontroller
2. MAX232for PC interface
3. RFTx433Mhz
4. RFRX433Mhz
5. 7805voltage regulator
6. H11173.3 Voltage regulator
7. 9Vbattery or 4.5Vbattery for tracker
8. USB to serial cable.
9. Accessories like to switch, Led and jumper wires

2. SOFTWARE REQUIRED

1. Arduino IDE.
2. Eclipse IDE.

III. LITERATURE SURVEY

Sungha Jang, Ashutosh Prasad, Brian T. Ratchford 2016[1] proposes Consumer spending patterns across firms and categories: Application to the size- and share-of-wallet, Predicting share-of-wallet and size-of-wallet (i.e., category expenditure) of customers requires a firm to have, in addition to its own sales, an estimate of customer spending at competing firms. Given data on competitive spending from a sample of customers, this study considers the problem of predicting consumer expenditures at competing firms when data is unavailable. The proposed methodology, designed for multi-category firms, is a simultaneous equation to bit model with latent classes which can handle three complicating factors: (i) heterogeneity in spending patterns; (ii) interrelationship of expenditures across firms and categories, called simultaneity; and (iii) data censoring, which occurs when consumers have zero expenditure in a category. The model is estimated on credit card data using Bayesian estimation.

Sagar S. Kulkarni, 2006[3] proposes Predicting

Online Customer Shopping Behavior, Business-to-consumer (B2C) is the most common online business type, which attempts to reach individual consumers. Compared to the brick-and-mortar environment, the use of the Internet for business-to-consumer transactions presents obvious advantages. The openness of the Internet creates opportunities for virtually all companies ranging from small start-ups to Fortune 100 companies. In particular, it allows companies to offer direct sales to their customers through an electronic Channel (Hoffman, et al, 1996). In the bricks-and-mortar stores, salespeople are hired to distinguish shoppers and to stimulate their maximum consuming desire based on their in-store behavior. When shoppers show special interest in some specific product, sales people will help them find what they are looking for. In other cases, for shoppers who are merely window shopping, salesperson can recommend some product to entice their shopping appetite. However, in the virtual shopping environment, there is no sales person to perform this role. Therefore, to understand consumer behavior in virtual stores is very important for online business. This research aims to provide theoretical analysis to explain consumers' shopping behaviour in virtual stores.

Abdul Brosekhan, Dr. C. Muthu Velayutham, 2009[4] proposes In Present Marketing Scenario, the Study of Consumer Behavior has become essential. Consumers are the kings of markets. Without consumers, no business organization can run. All the activities of the business concerns end with consumers and consumer satisfaction. Consumer buying behavior has become an integral part of strategic market planning. It is argued that consumer behaviour itself emerged as a distinct field of study during the 1960s; and is characterized by two broad paradigms, the positivist and the non-positivist. The positivist paradigm encompasses the economic, behavioral, cognitive, motivational / trait / attitudinal, and situational perspectives; these perspectives are referred to as the traditional perspectives .The opposing, non-positivist paradigm, homogenous social culture and thereby deny the complex social and cultural world in which consumers live. The traditional, positivist perspective takes a very utilitarian approach to the benefits from consumption. The objective of non-positivist research endeavor is to achieve a better understanding of consumer behavior with no specific intent to influence consumer processes.

S.Sathish, Dr.A.Rajamohan 2012[2] proposes Consumer behavior and lifestyle marketing. Lifestyle marketing is a process of establishing relationships between products offered in the Market and targeted lifestyle groups. It involves segmenting the market on the basis of lifestyle Dimensions, positioning the product in a way that appeals to the activities, interests and opinions of the targeted market and undertaking specific promotional campaigns which exploit lifestyle Appeals to enhance the market value of the offered product. The Marketing Dictionary of RonaOstrow and Sweetman R. Smith describes lifestyle as "a distinctive mode of behavior centered Around activities, interests, opinions, attitudes and demographic characteristics distinguishing One segment of a population from another. A consumer's lifestyle is seen as the sum of his Interactions with his environment. Lifestyle studies are a component of the broader behavioral Concept called psychographics.

Dianne Day, Boon Gan, Philip Kendall and Don Esslemont 1991[5] proposes Predicting Purchase Behavior, based on socioeconomic and demographic variables led researchers to experiment with consumer buying intentions and attitudes as alternative predictors (Juster 1960; Heald 1970; Gabor & Granger 1972). In short-term cross-sectional studies, buying intentions generally proved more accurate predictors of purchase behavior than attitudes (Klein & Lansing 1955; Tobin 1959; Adams 1964), but the absolute predictive ability of intentions was still poor (Juster 1966; Theil & Kosobud 1968; Pickering & Isherwood 1974). Thus, the focus of efforts to predict purchase behavior shifted to purchase probabilities, ultimately culminating in the development of an eleven-point purchase probability scale, commonly known as the Juster Scale.

Eleonora Pantano, Loredana Di Pietro 2012[6] Understanding Consumer's Acceptance of Technology-Based Innovations in Retailing proposes the availability of a huge number of studies about the Technology Acceptance Model (TAM) for predicting consumer's acceptance and usage of innovations in points of sale motivates writing of the present. Review, with emphasis on the new variables, integrated into the traditional model. This is concerned with a synthesis of the current progress in the field, thus offering a unified view of consumers' behavior towards new technical solutions. Such synthesis is achieved from an extensive literature analysis, including computer science, innovation, human-computer interaction, and technology management perspectives. For each case, both opportunities and issues are outlined in order to advance the current knowledge and highlight what practitioners and scholars should take into account for developing new and efficient corporate strategies.

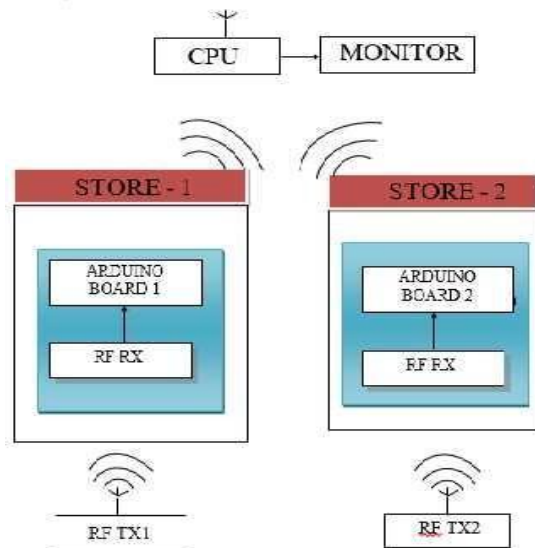
GAPS IN THE LITERATURE

- With reference to the above-published journals/Research paper, it is evident that none of the papers focused on the topic wherein a person spends time with individual products/stores.
- Very less or no technology is employed to formulate the shopping pattern of a consumer.
- The journals above do not produce any large scale clear image of consumers interested in a particular product.
- They do not help the enterprise or companies in suggesting the future product.
- Does not establish any relationship between consumer interest and financial constrain.

IV. SYSTEM DESIGN AND IMPLEMENTATION

The microcontroller that we are using in our project is Arduino and the microcontroller is connected to a RF receiver as shown in figure 2. This microcontroller and RF pair is the hardware required at every store. This microcontroller detects the presence of any RF transmitters in its vicinity, and when it detects any, the microcontroller gets connected to the RF transmitter and microcontroller decodes the unique id of the transmitter. The microcontroller

at the store can support simultaneous receiving of a signal from multiple RF Tx. In this prototype, the microcontroller can detect signal from the band nearby when its distance is nearly 5 feet. All these bands are programmed to have unique id's. This information i.e., the unique id of individual band is again transmitted wirelessly to the computer using RF, The information which is sent to the computer, determines the amount of time spent by the person on a particular product and this information is obtained in real-time on a monitor.



PROCEDURAL FLOW

The control module offers a series of flow to determine various conditions of operation. A summarized flowchart of the procedural CIAS is shown in Fig.

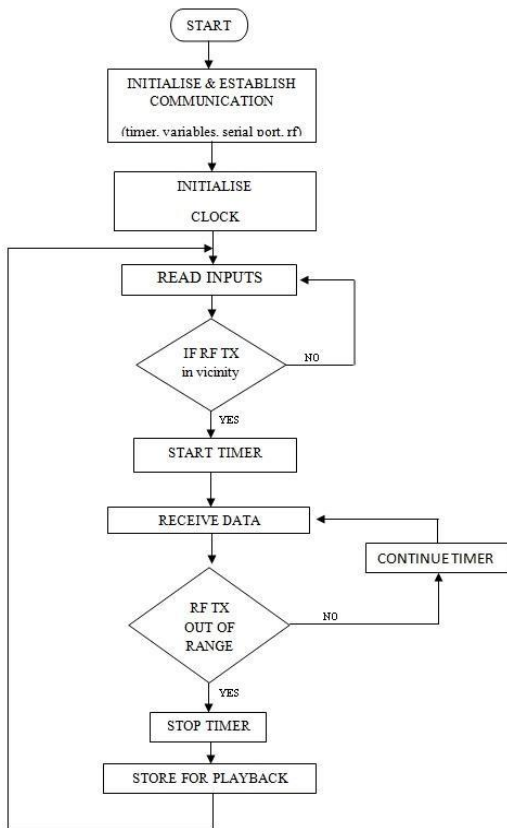


Fig. 3: Summarized flowchart of the procedural flow of CIAS

FLOW DIAGRAM

V. ADVANTAGES OF CIAS

- The System Can Be Implemented At Low Cost And Low Power.
- Creativity ,Simplicity and Affordability.
- Safe, Reliable ,Flexible and Portable.
- Precise Prediction of Customers Interest.
- Helps Company to Manufacture Future Products.
- Provides Marketing Solutions.
- Helps In Better Risk Management.
- Differentiates Shopping Behavior Of Opposite Gender.
- High Scope for Future Improvements.
- The Device Is Product Independent.
- The Band Has A Long Life.
- One Time Investment.
- Reduction of Man Power & Messy Paper Work.
- Bold & Diverse approach of Advertisements & Awareness Activities.
- The relationship between Shoppers and Brands.



FLOW DESCRIPTION

- At the very first the system will get started, and then the reader communication is established by initializing the required variables, timers, serial port and RF.
- When the signal is detected the RF reads the inputs and then starts to trigger and starts scanning.
- According to the condition if RF is in vicinity the timer starts counting and then the counted data is received and then stored in the memory of microcontroller. i.e; In time, out time, time spent and whether it's P1 or P2. Else it continues to read the input.
- If RF is out of range then the timer stops counting, else continue with the timer with reference to the data that has been received before.
- The data stored when it is in vicinity, which is saved in the memory of microcontroller is displayed as a end result and then transferred to the LCD for clear understanding of time. i.e., in time, out time, time spent and whether it's P1 or P2. Else it continues to read the input.
- At the end the consumer spent data is displayed in the LCD as a final result.

VI. FUTURE SCOPE AND DEVELOPMENT

- Instead of the bulky system we want to make our SMD (surface mount device) based PCB make it small enough to fit in a bracelet.
- Low power microcontroller and low power optimization techniques will be implemented to increase battery life to days.
- BLE (Bluetooth low energy) devices can be used which will give still finer range, the hence device can be used to track time spent at individual Counter more accurately and the device will be low power and compact.
- Instead of showing plain output on PC some good statistical analysis software can be made with proper GUI to give reports in PDF and show results in various graphs like pie chart and bar graph.
- We can make IOT based system to give global access to data.

VII. CONCLUSIONS

With implementation of our project will be able to track the pattern of the consumer shopping behavior, his/her specific interest on certain products and find their interest, these data's will not only help to plan better marketing strategies, but also help to in formulating methods to meet the customer satisfaction, plan to stock the correct volume of product required, help company start new enterprise ventures and last but not the least ensure a safer and better future for the company.

REFERENCES

1. Getting Started with Ardrino by Massimo Banzi
2. Wireless Sensor Networks by C. S. Raghavendra

3. www.strobotix.com/documents/RF_Based_Wireless_Remote.pdf
4. <http://tutorial.cytron.com.my/2012/09/03/remote-control-315mhz/>
5. [http://robokits.co.in/shop/index.php?main_page=product_info & products_id=76](http://robokits.co.in/shop/index.php?main_page=product_info&products_id=76)
6. <http://www.engineersgarage.com/contribution/ambhatt/4channel-ask-remote>
7. Datasheets of all the IC's used in the system.
8. http://en.wikipedia.org/wiki/Time_and_attendance
9. Embedded C by Michael J. Pont
10. Method And system for Anticipatory Package shipping by amazon.
11. Mendelson, Ehud. "System and method for providing indoor navigation and special local base service application for malls stores shopping centers and buildings utilize RF beacons." U.S. Patent No. 8,866,673. 21 Oct. 2014.
12. https://en.wikipedia.org/wiki/Location-based_service.
13. Building Wireless Sensor Networks with Arduino and Processing by Robert Faludi.

RFID Handbook: Fundamentals and applications by Klaus Finkenzelle