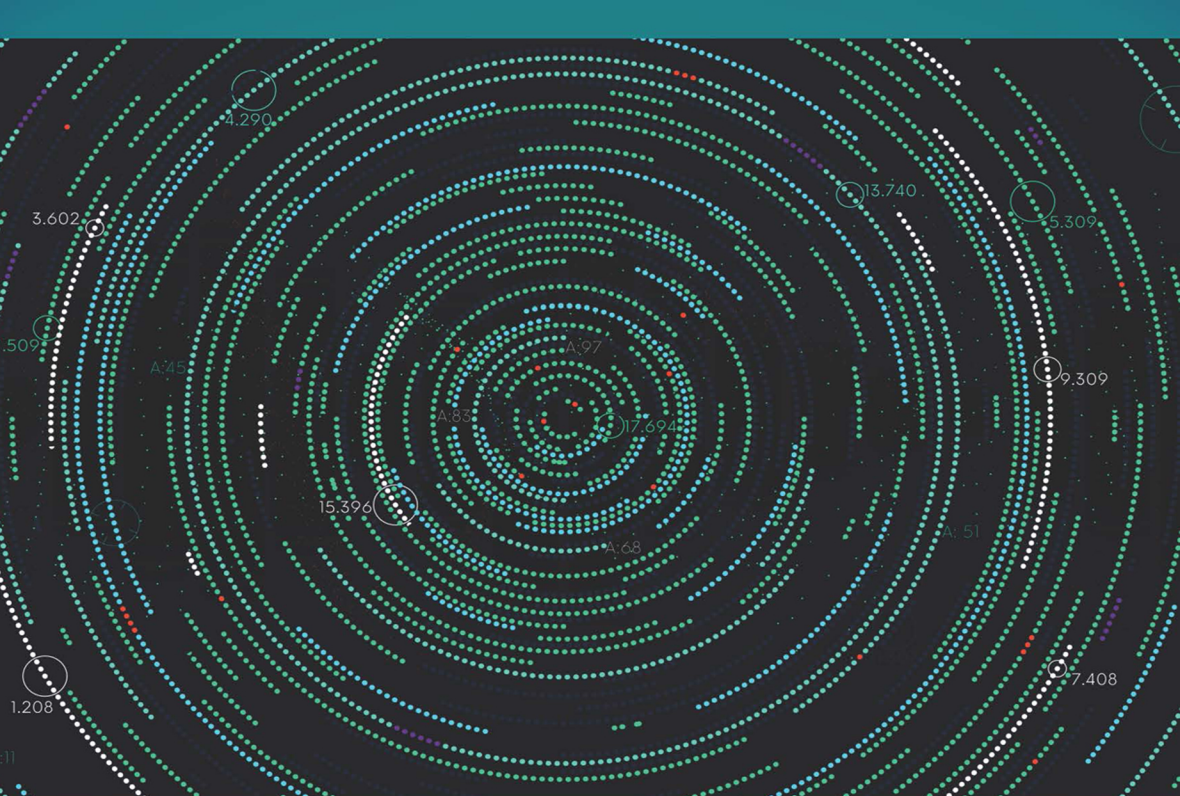




Intelligent Technologies for Sensors

Applications, Design, and
Optimization for a Smart World

S. Kannadhasan
R. Nagarajan
Alagar Karthick
Editors



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About the Editors



S. Kannadhasan is working as an Assistant Professor in the Department of Electronics and Communication Engineering at Study World College of Engineering, Coimbatore, Tamil Nadu, India. He has 12 years of teaching and research experience. He has completed his PhD in the field of Smart Antenna at Anna University in 2022. He earned his BE in ECE at Sethu Institute of Technology, Kariapatti, in 2009 and ME in Communication Systems at Velammal College of Engineering and Technology, Madurai in 2013. He earned his MBA in Human Resources Management at Tamil Nadu Open University, Chennai, India. He has published around 45 papers in reputed indexed international journals indexed by SCI, Scopus, Web of Science, and other major indexing services, and he has presented/published more than 146 papers in national and international journals and conferences. In addition, he has contributed a book chapter. He also serves as a board member, reviewer, speaker, session chair, advisory and technical committee member of various colleges and conferences. He has attended various workshops, seminars, conferences, faculty development programs, short-term training programs, and online courses. His areas of interest are smart antennas, digital signal processing, wireless communication, wireless networks, embedded systems, network security, optical communication, microwave antennas, electromagnetic compatibility and interference, wireless sensor networks, digital image processing, satellite communication, cognitive radio design, and soft computing techniques. He is a member of IEEE, ISTE, IEL, IETE, CSI, IAENG, SEEE, IEAE, INSC, IARDO, ISRPM, IACSIT, ICSES, SPG, SDIWC, IJSPR, and EAI Community.



R. Nagarajan is currently working as Professor of Electrical and Electronics Engineering at Gnanamani College of Technology, Namakkal, Tamil Nadu, India. He has published more than 70 papers in international journals and conferences. He has also worked in industry as an electrical engineer. His research interest includes power electronics, power system, communication engineering, network security, soft

computing techniques, cloud computing, big data analysis, and renewable energy sources. Dr. Nagarajan received his BE in Electrical and Electronics Engineering from Madurai Kamarajar University, Madurai, India, in 1997. He received his ME in Power Electronics and Drives from Anna University, Chennai, India, in 2008. He received his PhD in Electrical Engineering from Anna University, Chennai, India, in 2014.



Alagar Karthick is working as Associate Professor in the Electrical and Electronics Engineering Department in KPR Institute of Engineering and Technology, Coimbatore, Tamil Nadu, India. He has published more than 30 international journals and is also reviewer for various journals, such as *Solar Energy*, *Fuel*, *Journal of Cleaner Production*, *Heliyon*, and *Building Services Engineering Research and Technology*. He received

his Doctor of Philosophy in the field of Building Integrated Photovoltaic (BIPV) from Anna University, Chennai in 2018. He received a master's degree in Energy Engineering and bachelor's degree in Electrical and Electronics Engineering. He has received best paper awards for his research articles on biomass conversion. His research area includes solar photovoltaic, bioenergy, zero energy buildings, energy with artificial intelligence, machine learning, and deep learning algorithms.

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Contributors

Deepika Adhikary

Department of Electronics and Communication Engineering, NIST (Autonomous),
Berhampur, Odisha, 761008, India

G. Akshaykumar

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur 760010,
Odisha, India

Anitha G.

Department of Electronics and Communication Engineering, Saveetha School of Engineering,
Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai 602105, Tamil Nadu, India;
E-mail: anipsg09@gmail.com

J. Vijitha Ananthi

Department of Biomedical Engineering, Karunya Institute of Technology and Sciences, Coimbatore,
India; E-mail: vijithaananthi@karunya.edu.in, vijithaananthij@gmail.com

C. Balaji Ayyanar

Department of Mechanical Engineering, Coimbatore Institute of Technology, Coimbatore 60014,
Tamil Nadu, India; E-mail: balajiayyanar2007@gmail.com

R. Banupriya

Department of Electrical and Electronics Engineering, PGP College of Engineering & Technology,
Namakkal, Tamil Nadu, India; E-mail: priyarangasamy85@gmail.com

Arpita Bebartta

Department of Electronics and Communication Engineering, National Institute of Science and Technology,
Berhampur 761008, Odisha, India

Pradeep Chindhi

Department of Electrical Engineering, SGMCOE, Mahagaon 416503, Maharashtra, India;
E-mail: pradeepchindhi.4003@gmail.com

Ashish Kumar Dash

Department of School of Computer Science and Engineering, NIST (Autonomous), Berhampur 760010,
Odisha, India

Swastid Dash

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur 760010,
Odisha, India

S. R. Dash

Department of Electronics Communication Engineering, NIST (Autonomous) Berhampur,
Berhampur 760010, Odisha, India

P. Deepak

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur 760010,
Odisha, India

J. A. Dhanraj

Centre for Automation and Robotics (ANRO), Department of Mechanical Engineering,
Hindustan Institute of Technology and Science, Padur, Chennai 603103, Tamil Nadu, India

Chandramohan Dhasarathan

Computer Science and Engineering Department, Thapar Institute of Engineering and Technology,
Patiala, Punjab, India

B. Gayathri

Department of Chemistry, Coimbatore Institute of Technology, Coimbatore 60014, Tamil Nadu, India

R. Geetha

Department of Information Technology, Saveetha School of Engineering, Saveetha Institute of Medical
and Technical Sciences (SIMATS), Chennai 602105, Tamil Nadu, India

T. K. Giri

Department of Electronics Communication Engineering, NIST (Autonomous) Berhampur,
Berhampur 760010, Odisha, India

Bhabani Sankar Gouda

Department of Computer Science and Engineering, NIST (Autonomous), Berhampur 760010, Odisha,
India

Sanjeev Gour

Department of Computer Science, Career College Bhopal, MP, India

Subash Chandra Bose Jaganathan

School of Computing Science and Engineering, VIT Bhopal University, Sehore, MP, India

R. Jegan

Department of Biomedical Engineering, Karunya Institute of Technology and Sciences,
Coimbatore 641114, India

P. Subha Hency Jose

Department of Biomedical Engineering, Karunya Institute of Technology and Sciences,
Coimbatore 641114, India

Apoorva Joshi

Department of Computer Science, Career College Bhopal, MP, India; E-mail: apoorvajoshi16@gmail.com

S. Kannadhasan

Department of Electronics and Communication Engineering, Cheran College of Engineering, Karur,
Tamilnadu, India; email: kannadhasan.ece@gmail.com

Alagar Karthick

Electrical and Electronics Engineering Department, KPR Institute of Engineering and Technology,
Coimbatore, Tamilnadu, India; email: Karthick.power@gmail.com

Kanishk Kashyap

Department of Electrical and Electronics Engineering, National Institute of Science and Technology,
Berhampur 761008, Odisha, India

Geeta Kalkhambkar

Department of Electronics and Telecommunication Engineering, SGMCOE, Mahagaon, Maharashtra, India

R. Kalpana

Dept. of Computer Science and Engineering, Madanapalle Institute of Technology and Science,
Angallu, Andhra Pradesh, India

Alagar Karthick

Department of Electrical and Electronics Engineering, KPR Institute of Engineering and Technology, Coimbatore 641024, Tamil Nadu, India

Rajashri Khanai

Department of Electronics and Communication Engineering, KLE'S Dr. MSSCET, Belgaum, Karnataka, India

S. Sovan Kumar

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur, Odisha 760010, India

Yashwardhan Kumar

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur, Odisha 760010, India

J. Manjushree Kumari

Department of Electrical and Electronics Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu, India

B. Leelamani

Department of Biotechnology, Aurora's Degree and PG College, Chikkadpally, Hyderabad, Telangana, India

Sanjana Mahapatra

Department of Computer Science and Engineering, NIST (Autonomous), Berhampur, Odisha 760010, India

T. Manimegalai

Department of CSE, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai 600124, Tamil Nadu, India

Sandipan Mallik

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur, Odisha, 761008, India; E-mail: sandi.iitkgp@gmail.com; sandipan@nist.edu

K. Marimuthu

Department of Mechanical Engineering, Coimbatore Institute of Technology, Coimbatore 60014, Tamil Nadu, India

Ninoslav Marina

University of Information Science and Technology, "St. Paul the Apostle" Ohrid, North Macedonia

D. Mishra

Department of Computer science and Engineering, NIST (Autonomous) Berhampur, Berhampur 760010, Odisha, India

V. Mohanavel

Centre for Materials Engineering and Regenerative Medicine, Bharath Institute of Higher Education and Research, Chennai 600073, Tamil Nadu, India

Azath Mubarakali

College of Computer Science, Department of CNE, King Khalid University, Abha, Saudi Arabia

R. Nagarajan

Department of Electrical and Electronics Engineering, Gnanamani College of Technology, A. K. Samuthiram, Namakkal, Tamilnadu, India; email: krrajan71@gmail.com

Sonalika Nayak

Department of Electronics Communication Engineering, NIST (Autonomous), Berhampur 760010, Odisha, India

W. S. Nimi

Department of Biomedical Engineering, Karunya Institute of Technology and Sciences, Coimbatore 641114, India; E-mail: nimiwsrec@gmail.com

R. R. Padhi

Department of Electronics Communication Engineering, NIST (Autonomous) Berhampur, Berhampur 760010, Odisha, India

D. Panda

Department of Electronics Communication Engineering, NIST (Autonomous) Berhampur, Berhampur 760010, Odisha, India

Karuna Nidhi Pandagre

Department of Computer Science, Career College Bhopal, MP, India

Lokesh Singh Panwar

Department of Electronics and Communication, Polymer Sensor and Actuator Lab, Graphic Era Deemed to be University, Dehradun, India; E-mail: lokesh31j@gmail.com

Varij Panwar

Department of Electronics and Communication, Polymer Sensor and Actuator Lab, Graphic Era Deemed to be University, Dehradun, India

Sudhir Ranjan Pattanaik

Department of School of Computer Science and Engineering, NIST (Autonomous), Berhampur, Odisha 760010, India; E-mail: sudhir.pattanaik@nist.edu

Sai Swarup Patnaik

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur, Odisha 760010, India

Sumanjit Pattanayak

Department of Electrical and Electronics Engineering, National Institute of Science and Technology, Berhampur 761008, Odisha, India

V. R. K. Patro

Department of Computer science and Engineering, NIST (Autonomous) Berhampur, Berhampur 760010, Odisha, India

Bora Pavani

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur 760010, Odisha, India

Mădălin-Dorin Pop

Computer and Information Technology Department, Politehnica University of Timișoara, România

R. Thandaiah Prabu

Department of Electronics and Communication Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai 602105, Tamil Nadu, India

Shyam Sundar Pradhan

Department of Information Technology Engineering, NIST (Autonomous), Berhampur 760010, Odisha, India

Priyanka Pratihari

Department of Computer Science and Engineering, NIST (Autonomous), Berhampur 760010, Odisha, India

H. P. Rajani

Department of Electronics and Communication Engineering, KLE'S Dr. MSSCET, Belgaum, Karnataka, India

G. Ramkumar

Department of Electronics and Communication Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai 602105, Tamil Nadu, India; E-mail: pgrvlsi@gmail.com

V. V. R. Raman

Department of Computer Science, Aurora's Degree and PG College, Chikkadpally, Hyderabad, Telangana, India

Velmani Ramasamy

Computer Science and Engineering Department, Adithya Institute of Technology, Kurumbapalayam, Coimbatore, Tamil Nadu, India

S. Ramesh

Department of Electronics and Communication Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai 602105, Tamil Nadu, India

Obbinti Sankar Rao

Department of Electronics Communication Engineering, NIST (Autonomous), Berhampur, Odisha 761008, India

Manoj Kumar Sahoo

Department of School of Computer Science and Engineering, NIST (Autonomous), Berhampur, Odisha 760010, India; E-mail: mksahoo@nist.edu; mksahoo@hotmail.com

Monik Raj Sahu

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur, Odisha 760010, India

Anand Kumar Satapathy

Department of Computer Science and Engineering, NIST (Autonomous), Berhampur 760010, Odisha, India

K. Pandi Selvi

Thamirabharani Engineering College, Tirunelveli, Tamil Nadu, India

Swadhin Kumar Senapati

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur 760010, Odisha, India

Ambrish Kumar Sharma

Department of Computer Science, NRI College, Bhopal, MP, India

S. A. Shifani

Department of ECE, Jeppiaar Maamallan Engineering College, Chennai 602108, Tamil Nadu, India

Madhvi Singh

Department of Electronics and Communication Engineering, NIST (Autonomous), Berhampur, Odisha 761008, India

L. Suganya

Department of Electrical and Electronics Engineering, PGP College of Engineering & Technology, Namakkal, Tamil Nadu, India

M. Suganthi

AP/CSE Department, Thamirabharani Engineering College, Tirunelveli, Tamil Nadu, India; E-mail: sugi.mp@gmail.com

M. Suresh

Department of Electronics Communication Engineering, NIST (Autonomous), Berhampur, Odisha, 761008, India; E-mail: msuresh73@gmail.com

Kunjabihari Swain

Department of Electrical and Electronics Engineering, National Institute of Science and Technology, Berhampur 761008, Odisha, India

M. Tamilselvi

Department of Mechatronics Engineering, T.S. Srinivasan Centre for Polytechnic College and Advanced Training, Vanagaram, Chennai 600095, Tamil Nadu, India

Muruges Veerasamy

Department of CSE, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India

Renjith V. S.

Department of Biomedical Engineering, Karunya Institute of Technology and Sciences Coimbatore, India; E-mail: notify_renjithvs@yahoo.com

Abbreviations

ABS	automatic blocking system
ACK	acknowledge
ADC	analog to digital converters
ADS	advanced design system
AES	Advanced Encryption Standard
AI	artificial intelligence
ALPR	automatic license plate recognition system
ANPR	automatic number plate recognition system
APTS	advanced public transportation system
ATCC	automatic traffic counter cum classifier
ATIS	advanced traveler information system
ATMS	advanced transportation management system
ATPS	advanced transportation pricing system
ATR	attenuated total internal reflection
AWS	Amazon Web Services
BCI	brain–computer interface
BF	bamboo flour
BG	blood glucose
BP	blood pressure
BPM	beats per minute
BSHDT	brainwave-based smart home device triggering
BSN	body sensor network
BT	body temperature
CAGR	compound annual growth rate
CAIDI	customer average interruption duration index
CEHS	cooperative-based energy harvesting scheme
C-ITS	cooperative-ITS
CMOS	complementary metal–oxide semiconductor
CNN	convolutional neural network
CoRE	constrained restful environment
CSEE	clustered-based security and energy-efficient
CT	current transformer
CVD	cardio vascular disease
CVS	cooperative vehicle system

DApps	distributed applications
DAS	driver assistant system
DCM	discontinuous current mode
DEs	differential equations
DNN	deep neural networks
DOTs	departments of transportation
DSP	digital signal processors
DSRC	dedicated short-range communications
ECB	emergency calling box
ECG	electrocardiogram
EDA	electro-dermal activity
EEG	electroencephalograph
ELHMS	enhanced learning-based healthcare monitoring system
EMD	empirical mode decomposition
EMG	electromyogram
ERP	event-related potential
ETH	ethereum
EXI	efficient XML interchange
E2E	end-to-end
FIA	flow injection analysis
FIR	finite impulse response
FL	fault location
FN	future network
FPGA	Field Programmable Gate Array
GC	gas chromatography
GDPR	general data protection regulation
GHG	greenhouse gas
G-IoT	green internet of things
GIS	Geographical Information System
GPS	global positioning System
GPSSR	general-packet-radio-service
GSM	global system for mobile
HB	harmonic balance
HCI	human–computer interaction
HD	Hodgkin’s disease
HPF	high-pass filter
HPLC	high-performance liquid chromatography
HR	heart rate
IaaS	infrastructure as a service
ICO	initial coin offering

IETF	internet engineering task force
IIR	infinite impulse response
IoE	internet of energy
IoE	internet of everything
IoS	internet of services
IoT	Internet of Things
IoTaaS	Internet of Things as a service
IPTV	internet protocol television
IR	infrared
ISM	industrial scientific and medical band
ITS	intelligent transportation systems
JS	JavaScript
LeNN	single layer legendre neural network
MaaS	Mobility-as-a-Service
MDS	meteorological data station
MEMS	micro-electro-mechanical-systems
MIMO	multiple-input and multiple-output
MRCS	mobile radio communication system
MS	mass spectrometry
NDVI	Normalized Difference Vegetable Index
NHL	non-Hodgkin lymphoma
NHSR	National Health Statistics Reports
ODE	ordinary differential equations
OCR	optical character recognition
PaaS	platform as a service
PD	photodetector
PDE	partial differential equations
PP	polypropylene
PLI	power line interference
PV	photovoltaic
QoS	quality of service
RF	radio frequency
RFID	radio frequency identification
RHD	resistive heat detectors
RHF	rice husk fiber
ROI	return on investment
ROLL	routing over low-power and lossy networks
ROM	read-only memory
RSA	Rivest–Shamir–Adleman
RSSI	receiver signal strength indicator

SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index
SCS	<i>Syzygium Cuminiseed</i>
SDGs	sustainable development goals
SFMU	smart field monitoring unit
SG	smart grid
SHCMK	smart healthcare monitoring kit
SNR ratio	signal to noise ratio
SOC	system on a chip
SPDEs	singularly-perturbed differential equations
SpO ₂	oxygen saturation
S-RAM	static-random access memory
SRV	ServiceCoin
SSL	secure sockets layer
STWS	single term Walsh series
TCP/IP	Transmission Control Protocol/Internet Protocol
TCR	temperature coefficient of resistance
TDMS	time-division multiple access
TMCs	traffic management centers
TMCs	transportation management centers
TxDOT	Texas Department of Transportation
ULP	ultra-low power
VANET	vehicle ad-hoc networks
VIDS	video incident detection system
VMS	variable message sign
VMT	vehicle miles travelled
VR	virtual reality
VRP	vehicle-routing problem
VSH	virtual smart home
V2I	vehicle-to-infrastructure
V2IoT	vehicle-to-IoT
V2V	vehicle-to-vehicle
V2X	vehicle-to-everything
WBAN	wireless body area network
WF	waste fish
WHO	World Health Organization
WSNs	wireless sensor network
6LoWPAN	IPv6 over low-power wireless personal area networks
W3C	World Wide Web Consortium

Preface

This book provides an overview of systems and machines that are intelligent. It is intended for anybody who is interested in future advancements in these domains or wants to be informed on the current state of these multidisciplinary technologies.

Sensor devices that are flexible and printable have received a lot of interest in recent years. New techniques like as printing and additive manufacturing are being developed to realize a wide range of readily deployable systems such as displays, sensors, and RFID tags. The needs of the growing area of modular and writable sensors are being met by repurposing silicon-based planar electronics and solid-state sensing technology. This book brings together leading academics, architects, and scientists who are experts in the subject from across the globe. Engineers discuss about their research projects, experiments, discoveries, innovative ideas and principles, contributions, and advancements in the fields of inventions and software, measurement theories and applications, and instrumentation theories and applications.

Pervasive, reliable, robust, and streamlined positioning technologies will benefit a wide range of resources, including personal navigation, search and rescue, robot and fleet control, and health care. Despite the fact that there are mature GNSS solutions for outside areas, more than 10 years of sensor technology research and development have failed to provide a widely available offer of generic and cheap standard solutions for inside. A new technology is the requirement for sophisticated computing technologies to evolve in order to satisfy the increasing needs of knowledge and communication technologies in smart real-time world applications. There are a number of clever technologies that may help the educational system significantly.

We would like to take this opportunity to thank our family members and friends, who encouraged us a lot during the preparation of this book. First and most obviously, we give all the glory and honor to our almighty Lord for his abundant grace that sustained us for successful completion of this book. We would like to thank the authors for their contribution in this edited book. We would also like to thanks Apple Academic Press, CRC Press, a Taylor & Francis Group and its whole team for facilitating the work and providing us the opportunity to be a part of this work.



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PART I
Applications of Intelligent Technologies
for Sensors



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CHAPTER 1

Product Details Identification for Visually Impaired Persons

M. SUGANTHI^{1*} and K. PANDI SELVI²

¹*AP/CSE Department, Thamirabharani Engineering College, Tirunelveli, Tamil Nadu, India*

²*Thamirabharani Engineering College, Tirunelveli, Tamil Nadu, India*

**Corresponding author. E-mail: sugi.mp@gmail.com*

ABSTRACT

Android is a smartphone and tablet operating system that is free and open-source. Smartphones are used for the majority of activities, such as e-commerce and commercial processing. People with visual impairment face difficulties to read the details of the product. So to help the visually impaired people in purchasing the projects, we developed an application in Android and PHP. As most of the supermarkets sell products of all brands in a single place, visually impaired people can shop easily with the assistance of QR code generated by shop owners through the web application. The product information for the QR code produced will be registered by the business owner. Then the customer with the “VIP Helper” Android application can easily scan the QR code and the application speaks aloud the product details like product name, brand, price, expiry date of the product which is embedded. So this greatly helps the visually impaired people by eliminating the third person’s assistance in shopping at ease.

1.1 INTRODUCTION

A customer looks through the available items or services from one or more merchants with the intention of purchasing a suitable option. Scholars have developed a shopper typology that categorizes one sort of shopper as recreational shoppers, or those who like shopping as a leisure activity. Consumers can now look up product information and place purchases across several platforms, making internet shopping a major disruptor in the retail industry. Customers' purchases are delivered to their homes, offices, or other locations by online retailers. Thanks to the business to consumer approach, customers may now choose any product from a retailer's website and have it delivered quite quickly. By not having to travel to actual stores, consumers who utilize online shopping strategies save time and energy. They may be able to save both time and money as a result of this. A retailer, often known as a shop, is a business that exhibits a wide range of goods and offers to trade or sell them to customers in return for money or other goods. Customers' purchasing experiences may vary. They are influenced by a variety of factors, including how the customer is treated, the ease with which the transaction is completed, the items purchased, and the consumer's mood.

1.2 ONLINE SHOPPING

One of the earliest sorts of internet commerce was IBM's online transaction processing, which was developed in the 1960s and allowed for the real-time processing of financial transactions. The Semi-Automatic Business Research Environment, a computerized ticket reservation system for American Airlines, was one of its uses. A massive IBM mainframe computer linked computer terminals at multiple travel agencies, processing, and coordinating transactions so that all travel agents had access to the same information at the same time. The growth of online shopping¹ as we know it now began with the introduction of the Internet. Initially, this platform was just a tool for companies to promote and share information about their products. It quickly advanced from this fundamental utility to true online purchase transactions thanks to the creation of dynamic Web sites and secure connections. With the initial sales of Sting's album "Ten Summoner's Tales" in 1994, the internet started to grow as a secure purchasing channel. Wine, chocolates, and flowers were among the first retail categories to promote the expansion of online shopping, and they were among the pioneering retail categories. The presence of e-commerce-ready items is a strong predictor of Internet success, according

to researchers. Many of these things worked well because they were generic items that customers did not have to touch or feel before buying. But, more importantly, there were few internet users in the early days, and those that did were from a certain demographic: rich guys in their 30s.

1.3 RETAIL SHOPPING

Retail is the business of earning money by selling consumer goods or services to customers via different distribution channels. A supply chain has identified a requirement that retailers must satisfy. The word “retailer” is used when a service provider fills modest orders for a large number of end-users rather than large purchases for a small number of wholesale, corporate, or government customers. Shopping refers to the act of buying items. This is done to get final things, such as food and clothing, and it is also done as a recreational activity. Window shopping and browsing are popular leisure shopping activities that may not always result in a purchase. Markets and retail businesses have a long and famous history that dates back to antiquity. The earliest retailers were itinerant peddlers.⁷ Throughout the years, retail businesses have grown from basic “rude booths” to elaborate shopping malls of the modern day.

1.4 PRODUCT DETAILS IDENTIFICATION

As we progress into the contemporary era of technology, we may discover that many engineering-related applications are very helpful to society’s development. This is the technological world, where individuals utilize cellphones to do everyday activities such as shopping, job management, and so on. The specifics of a product are difficult to read for those with vision impairment. By scanning the QR code of the goods, this initiative assists visually challenged individuals in learning about the product description. This programme may also be used to create new QR codes. This application is for visually impaired individuals who want to provide product information via voice. It focuses on shopping facilities.

1.4.1 EXISTING SYSTEM

Visually challenged individuals used to shop with the assistance of others under the current arrangement. They need regular people’s assistance. The

checkout operator software in an existing system produces a table containing the product name and expiry date, which is subsequently uploaded to the cloud. The customer scans a single Quick Response number written⁵ on the purchase receipt using his or her smartphone. The table is then instantly downloaded from the cloud to the smart phone.

1.4.2 PROBLEM DEFINITION

The existing system gives the notification to display product details. User must depend on third person to know the details of product. Locating the barcode using mobile is difficult.

1.5 PROPOSED SYSTEM

In the proposed system, to help the visually impaired people in purchasing the project, we develop the application in Android. This application reads the product information from the QR code. The PHP language is used to create the QR code. The product information is incorporated in the QR code when it is being generated. An event like QR scanning and reading product information does not involve the use of the internet is shown in Figure 1.1.

1.5.1 SYSTEM ARCHITECTURE

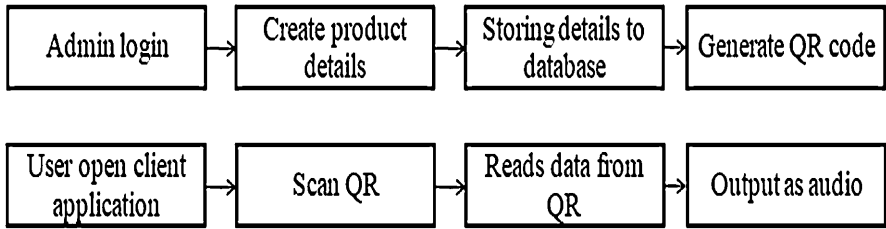


FIGURE 1.1 Block diagram of product details identification.

1.5.2 IMPLEMENTATION

When the theoretical design is transformed into a working system, it is called implementation. This is the most important stage in creating a new, effective

system. It can only be deployed once all testing has been completed and the system has been confirmed to fulfill the criteria. The implementation phase includes a number of tasks. The purchase of hardware and software is completed. It's possible that the system will need the creation of certain software. The compilation and execution of the planned system are both part of software implementation. During this stage, modular and subsystem programming code will be completed. The developers do unit and module testing at this stage.

The proposed system has three modules. The modules are:

- QR generation
- QR reading
- Output as speech

QR Generation

The administrator module is where this is done. This QR code for available items is generated by the business or shopping center owner. The site's controller is the Category Administrator. He is in charge of product development. The product's category is created by the first administrator. It is then presented in the module when it has been constructed. The unwelcome category may then be deleted from the website. The primary division of items such as Cookies, Cosmetics, Hair oil, and Dairy Products are examples of categories.

New Product

In this module, the administrator creates a new product. First administrator selects the categories that were created earlier, and then the product name, brand, units, and price are entered. Then the product is created. The created product is displayed in this module and unwanted products can be removed.

Edit Product

If the administrator needs to modify the product information such as price, brand, and name, then in this module it can be changed. After selecting the product the product information is shown in the screen. Then the administrator can modify any information of the product. Then on submitting the form the product information is modified and stored in the server.

Print QR Code

The administrator can print QR codes by categories. On selecting the categories the corresponding QR code and the name of the product are printed in the screen. Then the administrator can take print using the printer. This QR code can be placed in the products in the shop, so that the customers can read the QR code with the android application.

QR Reading

This is done using android-based mobile phones. Using the camera in the mobile phone the user can scan the available QR code. Then it fetches the information that is embedded inside the QR code given by the administrator who generated the QR code.

Output as Speech

The last job is to read out the information derived from the QR code. The QR code carries product information such as the product name, brand, price, and so on. The QR code is then scanned by the Android application and spoken to the user. As a result, blind individuals may shop for things without the need for an aid.

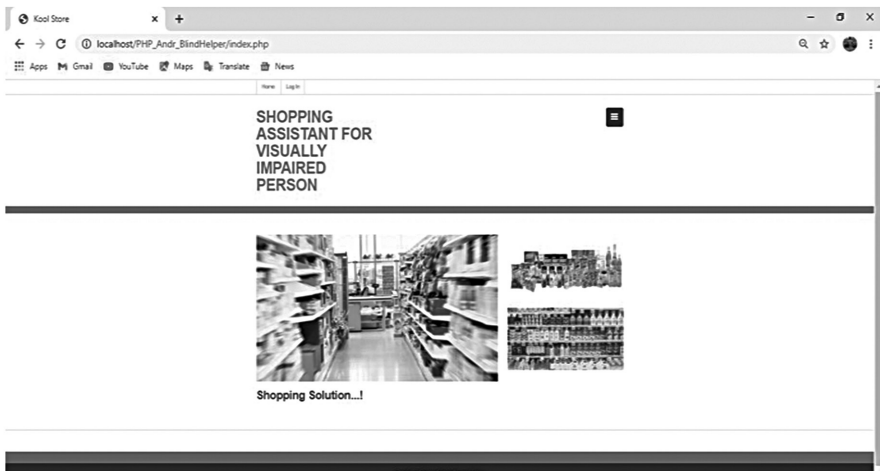


FIGURE 1.2 Home page.

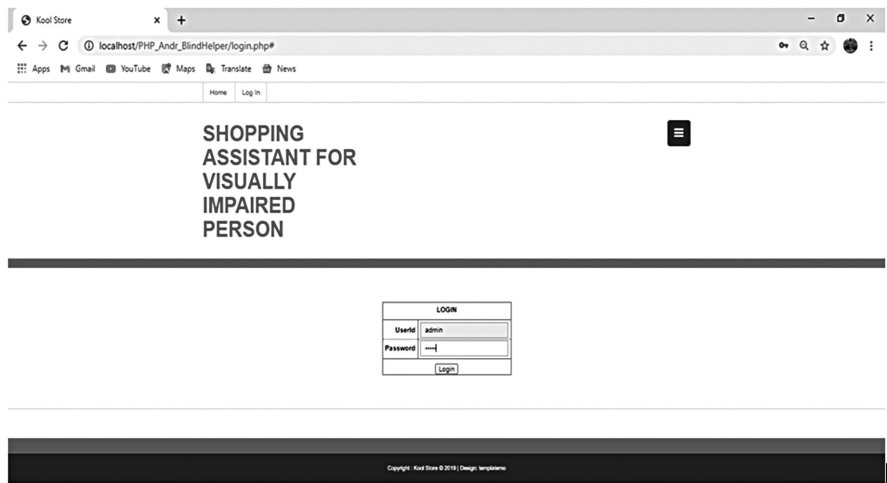


FIGURE 1.3 Login page.

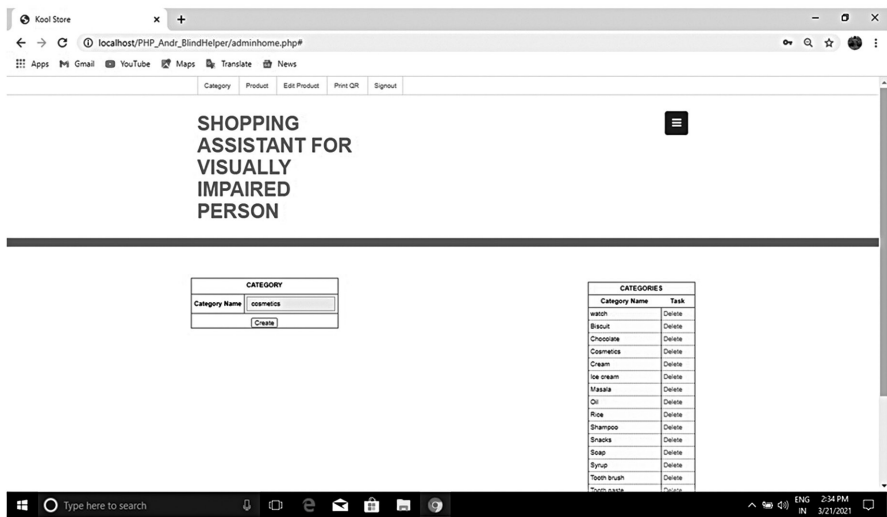


FIGURE 1.4 Create category.

1.6 CONCLUSION

The application’s creation provides us with a nice experience while delivering great outcomes. The goal of the project “VIP Helper” is to identify

users who have a basic understanding of computers. It enables individuals to do their essential tasks through the internet. The project is completed on a computer. It is a quick procedure that saves both time and money.

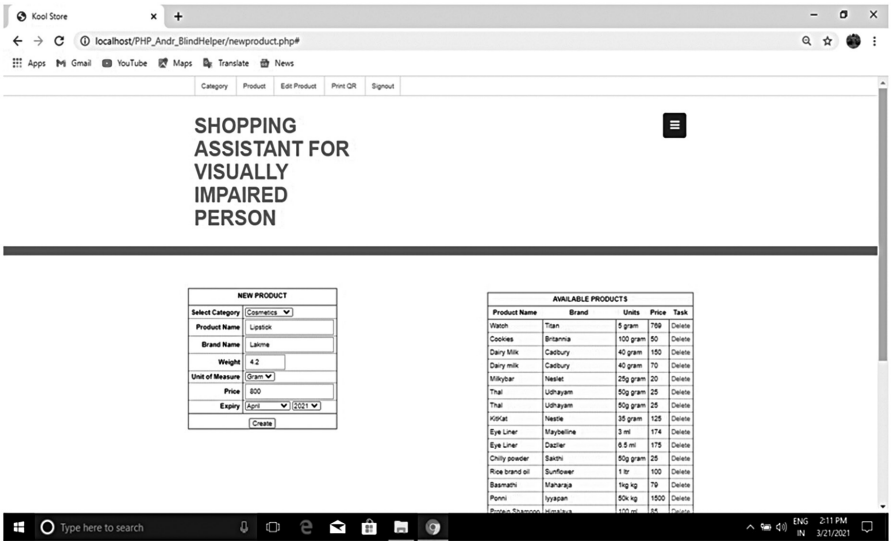


FIGURE 1.5 Create new product.

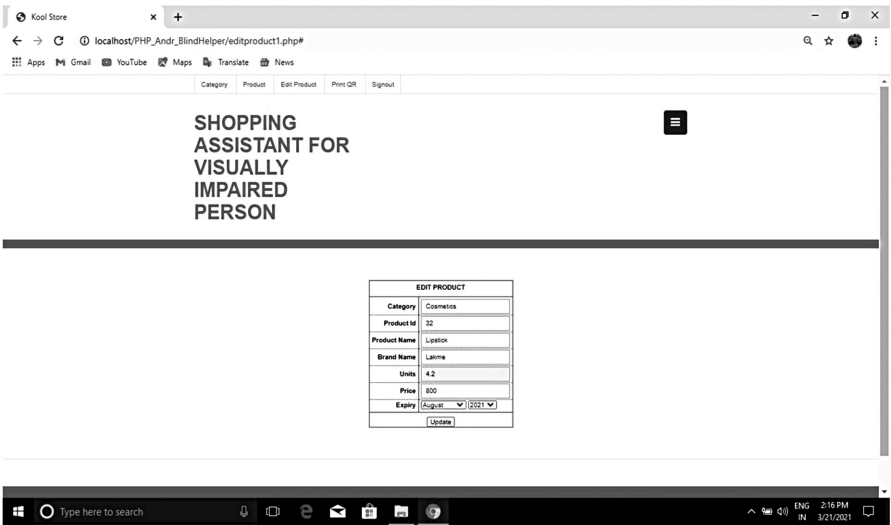


FIGURE 1.6 Edit product details.

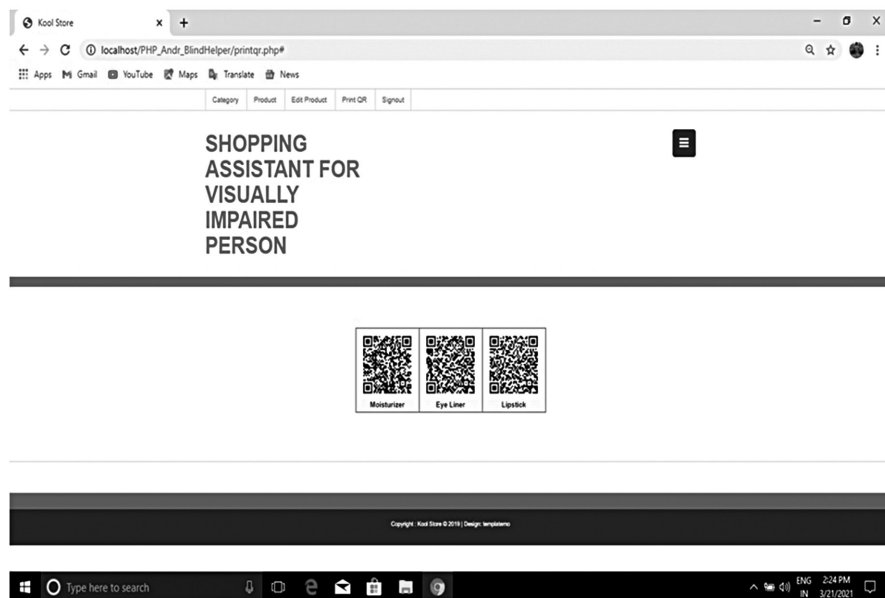


FIGURE 1.7 Generate QR code.

1.7 FUTURE ENHANCEMENT

We know that much information cannot be stored in a QR code under the present system. So, in the future, more information should be stored in QR codes so that more information may be retrieved even when the QR code is used by visually impaired individuals. We'll create a sound in several more languages in the future.

KEYWORDS

- **android**
- **QR code**
- **shopper**
- **authetication**
- **customer**

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