**DESIGNING TALKING ATM SOFTWARE SYSTEM**

**ABSTRACT**

we discuss process of design and development of talking ATM for visually impaired people. Automated Teller Machine (ATM) has become vital part of our life to perform financial transactions without intervention of human banker. ATM facilitates cash withdrawal, balance check, mini statement and fund transfer. But, these banking services using ATM cannot be directly used by some set of people of society such as people with low vision, visually impaired, illiterate as lack of accessing ATM through screens. Even they can be defrauded at ATM centers. To digitally include these set of people, talking ATMs are evolved. Talking ATM provides accessibility to ATM services by providing audio component. Many ATMs employ headphone jack that facilitates user to do transaction with security. The audio information is generated either using pre-recorded speech corpus or through speech synthesis engine. The paper summarizes how ATM works, need, proposed solution of talking ATM for visually impaired users, design and development talking ATM using concatenated Text To Speech.

**INTRODUCTION**

Certainly! Here's a description of an Automated Teller Machine (ATM)

An Automated Teller Machine, or ATM, is a technological marvel that graces the modern world. Nestled on street corners and within the walls of financial institutions, it beckons to individuals seeking to unlock the gates of their financial kingdom. This electronic sentinel, adorned with buttons and a screen, offers a portal to one's monetary realm. With a plastic card as the key, it ushers users into a realm of digital currency.

Whether under the starry canopy of night or the bright embrace of the sun, the ATM stands at the ready. It offers its services with unwavering reliability, providing access to one's accounts, the ability to withdraw cash, check balances, and execute various financial transactions.

In the rhythm of everyday life, it becomes a dependable companion. It whispers secrets encoded in PINs and dispenses crisp banknotes, forging a connection between personal finances and the vast realm of banking. With its discreet charm and subtle efficiency, the ATM plays an integral role in the modern world, simplifying financial interactions and granting access to one's financial universe with a touch, a card, and a code.

**Visual impairment**

Visual or vision impairment (VI or VIP) is the partial or total inability of [visual perception](https://en.wikipedia.org/wiki/Visual_perception" \o "Visual perception). For the former and latter case, the terms low vision and blindness respectively are often used. In the absence of treatment such as corrective eyewear, assistive devices, and medical treatment – visual impairment may cause the individual difficulties with normal daily tasks including reading and walking. In addition to the various permanent conditions, fleeting temporary vision impairment, [amaurosis fugax](https://en.wikipedia.org/wiki/Amaurosis_fugax" \o "Amaurosis fugax), may occur, and may indicate serious medical problems.

The most common causes of visual impairment globally are uncorrected [refractive errors](https://en.wikipedia.org/wiki/Refractive_errors" \o "Refractive errors) (43%), [cataracts](https://en.wikipedia.org/wiki/Cataract" \o "Cataract) (33%), and [glaucoma](https://en.wikipedia.org/wiki/Glaucoma" \o "Glaucoma) (2%). Refractive errors include [near-sightedness](https://en.wikipedia.org/wiki/Near-sightedness" \o "Near-sightedness), [far-sightedness](https://en.wikipedia.org/wiki/Far-sightedness" \o "Far-sightedness), [presbyopia](https://en.wikipedia.org/wiki/Presbyopia" \o "Presbyopia), and [astigmatism](https://en.wikipedia.org/wiki/Astigmatism_(eye)" \o "Astigmatism (eye)). Cataracts are the most common cause of blindness. Other disorders that may cause visual problems include [age-related macular degeneration](https://en.wikipedia.org/wiki/Age-related_macular_degeneration" \o "Age-related macular degeneration), [diabetic retinopathy](https://en.wikipedia.org/wiki/Diabetic_retinopathy" \o "Diabetic retinopathy), [corneal clouding](https://en.wikipedia.org/wiki/Corneal_opacification" \o "Corneal opacification), [childhood blindness](https://en.wikipedia.org/wiki/Childhood_blindness" \o "Childhood blindness), and a number of [infections](https://en.wikipedia.org/wiki/Infection" \o "Infection). Visual impairment can also be caused by problems in the [brain](https://en.wikipedia.org/wiki/Brain" \o "Brain) due to [stroke](https://en.wikipedia.org/wiki/Stroke" \o "Stroke), [premature birth](https://en.wikipedia.org/wiki/Premature_birth" \o "Premature birth), or trauma, among others. These cases are known as [cortical visual impairment](https://en.wikipedia.org/wiki/Cortical_visual_impairment" \o "Cortical visual impairment). Screening for vision problems in children may improve future vision and educational achievement. Screening adults without symptoms is of uncertain benefit. Diagnosis is by an [eye exam](https://en.wikipedia.org/wiki/Eye_exam" \o "Eye exam). The [World Health Organization](https://en.wikipedia.org/wiki/World_Health_Organization" \o "World Health Organization) (WHO) estimates that 80% of visual impairment is either preventable or curable with treatment. This includes cataracts, the infections [river blindness](https://en.wikipedia.org/wiki/Onchocerciasis" \o "Onchocerciasis) and [trachoma](https://en.wikipedia.org/wiki/Trachoma" \o "Trachoma), glaucoma, diabetic retinopathy, uncorrected refractive errors, and some cases of childhood blindness. Many people with significant visual impairment benefit from [vision rehabilitation](https://en.wikipedia.org/wiki/Vision_rehabilitation" \o "Vision rehabilitation), changes in their environment, and assistive devices.

As of 2015, there were 940 million people with some degree of vision loss. 246 million had low vision and 39 million were blind. The majority of people with poor vision are in the [developing world](https://en.wikipedia.org/wiki/Developing_world" \o "Developing world) and are over the age of 50 years. Rates of visual impairment have decreased since the 1990s. Visual impairments have considerable economic costs both directly due to the cost of treatment and indirectly due to decreased ability to work.

**Talking ATM**

A Talking ATM is a remarkable innovation that enhances accessibility for individuals with visual impairments. This specialized ATM features an audio interface that provides spoken instructions and feedback to users, making it possible for them to independently perform financial transactions.

The ATM is equipped with a headphone jack or built-in speaker, ensuring that users can listen to the instructions and responses clearly. It guides users through each step of the transaction process, from inserting their card to entering their Personal Identification Number (PIN), selecting the type of transaction, and receiving account balance or cash. The spoken instructions and options are designed to be intuitive, ensuring that users can navigate the machine with ease.

This technology empowers individuals with visual impairments to manage their finances independently and with confidence. The Talking ATM exemplifies the inclusive and innovative spirit of our modern world, where technology is harnessed to break down barriers and provide equal access to financial services for all.

**T**

**EXT TO SPEECH**

Text-to-Speech (TTS) is a fascinating technology that converts written text into spoken language. It bridges the gap between the written and spoken word, enabling a wide range of applications. TTS technology employs complex algorithms to analyze and synthesize text, producing natural and intelligible speech. It has become a valuable tool for enhancing accessibility, aiding individuals with visual impairments or reading difficulties.

In addition to its assistive applications, TTS plays a vital role in the digital realm. It is used in voice assistants, e-learning platforms, audiobooks, and more, providing a lifelike and engaging voice for various applications. TTS technology continues to evolve, with more natural-sounding voices and improved linguistic accuracy, contributing to a world where information is readily accessible through the power of spoken language. It is a testament to the ongoing fusion of technology and communication, making the world more accessible and inclusive. Certainly! Continuing from where we left off:

TTS technology has also found its place in the world of entertainment and multimedia. It enriches the gaming experience by giving voice to in-game characters and narrations, adding depth and immersion to the virtual worlds we explore. Additionally, it simplifies the process of creating voiceovers for videos, saving time and resources for content creators.

In the realm of language learning and communication, TTS offers the opportunity to practice and perfect pronunciation, helping individuals develop their language skills. It allows learners to hear correct pronunciations and practice in a supportive environment. Moreover, TTS is a valuable tool in the multilingual world, facilitating the translation of written content into spoken form for diverse global audiences.

As TTS technology continues to advance, it's increasingly indistinguishable from human speech, with nuances in tone, pitch, and emotion. This progress not only aids in making technology more accessible but also opens up new creative possibilities for storytelling, content creation, and more. The future holds even more promise for TTS, as it becomes an integral part of our daily lives, making information and communication more inclusive, dynamic, and engaging.

**ABOUT THE PROJECT**

ATMs are cash machines which enables bank customers to withdraw cash from electronic device without any human interaction i.e. cashier. Most of the ATM's allow cash withdrawal from machine not belonging to banks where customer does not have account through interbank networking. When a customer swipes card in a machine, account information stored in magnetic strip on card is read by card reader in machine (see Fig.1). Then machine requests for entering pin which is encrypted and send via router to base transmission station (BTS). BTS transmits request to host processor linked with bank terminal. Host processor verifies pin with bank information. If customer requests for cash withdrawal then request is forwarded to host processor through networks for approval. The network demands bank to verify customer's account for balance through private network among them. After verification, e-fund is transferred from bank to host processor. In turn host processor sends approval code to ATM. An electronic eye counts currency and money comes out of the cash dispenser. Thus, ATMs are facilitating easy access to banking sector but for users with low vision, visually impaired, people who are dyslexic, people who can't read and people not speaking English are not able to use the ATM services like normal users. In India, Reserve Bank of India (RBI) circulars and the Indian Banks’ Association (IBA) procedural guidelines on inclusive banking have established a strong basis for Inclusive Banking for Disabled Persons, particularly Blind and Low-Vision customers . This circular lays down standards of what is truly accessible ATMs. It mentions accessibility for wheel-chairs, Braille keypads, standardized user interface, IVRS-based menus, language support for Hindi and English, local language can be extended and security by option of screen-off.

**LITERATURE REVIEW**

**VOICE ENABLED ATM MACHINE WITH IRIS RECOGNITION FOR AUTHENTICATION**

**R.D.SALAGAR et.al s**ays Automated teller machines (ATMs) are a classic example of ubiquitous computing as they pervade our everyday life. Security is of paramount importance during ATM transactions. People choose passwords which are easy to remember, and, typically, easily predicted, or they change all PINs to be the same. Another concern is the accessibility of ATM machines to differently abled people. These concerns can be overcome by using iris recognition for authentication and voice enabled transactions in ATM machines. The iris patterns of the two eyes of an individual or those of identical twins are completely independent and uncorrelated. Iris recognition involves pre-processing, feature extraction and matching. Matching is done by comparing the user iris with the iris database images which were acquired at the time of opening an account in the bank. Once the authenticity of the user iris is verified, the user is allowed to carry out further transactions using voice based commands by speaking into a microphone. This model not only ensures security but also easy accessibility to certain sections of the population like people with visual impairments. Traditionally, access to secure areas or sensitive information has been controlled by possession of a particular artifact (such as a card or key) and/or knowledge of a specific piece of information such as a Personal Identification Number (PIN) or a password. Today, many people have PINs and passwords for a multitude of devices, from the car radio and mobile phone, to the computer, web-based services and their bank information. Herein lies a major difficulty involving the trade-off between usability, memorability and security. Term biometrics refers to any and all of a variety of identification techniques, which are based on some physical or behavioral characteristics of the individual, contrasted with those of the wider population. Physiological biometric techniques include those based on the verification of fingerprint, hand and/or finger geometry, eye (retina or iris), face, wrist (vein), and so forth. Behavioral techniques include those based on voice, signature, typing behavior, and pointing. Iris recognition is a rapidly expanding method of biometric authentication that uses pattern-recognition techniques on images of irises to uniquely identify an individual have been extensively deployed in commercial iris recognition systems for various security applications. It is the most promising among various biometric techniques (face, fingerprint, palm vein, signature, palm print, iris, etc.) because of its unique, stable, and noninvasive characteristics. The iris patterns of the two eyes of an individual or those of identical twins are completely independent and uncorrelated. Iris recognition system can be used to either prevent unauthorized access or identity individuals using a facility. When installed, this requires users to register their system. A distinct iris code is generated for every iris image enrolled and is saved within the system. Once registered, a user can present his iris to the system and get identified. Enrollment takes less than 2 minutes. Authentication takes less than 2 seconds. Voice-activated automatic teller machines were designed to help people with visual impairments, including some elderly people, make financial transactions. Not every blind person can read Braille, and so ATM’s equipped with Braille keypads don’t always suffice. In addition, Braille keypads may allow blind people to enter the information they need to, but they don’t provide a means of delivering directions to visuallyimpaired customers. So unless a blind person were to walk into a bank already knowing exactly how to use the ATM, it might not be possible for him or her to make transactions without assistance from a bank employee. Indeed, in the past, some visually-impaired people tended to avoid ATM’s altogether. However, a voice-activated ATM solves most, if not all, of those problems.[1]

**DESIGN AND IMPLEMENTATION OF TEXT TO SPEECH CONVERSION FOR VISUALLY IMPAIRED PEOPLE**

**Itunuoluwa Isewon et.al says** A Text-to-speech synthesizer is an application that converts text into spoken word, by analyzing and processing the text using Natural Language Processing (NLP) and then using Digital Signal Processing (DSP) technology to convert this processed text into synthesized speech representation of the text. Here, we developed a useful text-to-speech synthesizer in the form of a simple application that converts inputted text into synthesized speech and reads out to the user which can then be saved as an mp3.file. The development of a text to speech synthesizer will be of great help to people with visual impairment and make making through large volume of text easier. Text-to-speech synthesis -TTS is the automatic conversion of a text into speech that resembles, as closely as possible, a native speaker of the language reading that text. Text-tospeech synthesizer (TTS) is the technology which lets computer speak to you. The TTS system gets the text as the input and then a computer algorithm which called TTS engine analyses the text, pre-processes the text and synthesizes the speech with some mathematical models. The TTS engine usually generates sound data in an audio format as the output. The text-to-speech (TTS) synthesis procedure consists of two main phases. The first is text analysis, where the input text is transcribed into a phonetic or some other linguistic representation, and the second one is the generation of speech waveforms, where the output is produced from this phonetic and prosodic information. These two phases are usually called high and low-level synthesis.

A simplified version of this procedure is presented in figure 1 below. The input text might be for example data from a word processor, standard ASCII from e-mail, a mobile text-message, or scanned text from a newspaper. The character string is then pre-processed and analyzed into phonetic representation which is usually a string of phonemes with some additional information for correct intonation, duration, and stress. Speech sound is finally generated with the low-level synthesizer by the information from high-level one. The artificial production of speech-like sounds has a long history, with documented mechanical attempts dating to the eighteenth century. Speech synthesis can be described as artificial production of human speech [3]. A computer system used for this purpose is called a speech synthesizer, and can be implemented in software or hardware. A text-to-speech (TTS) system converts normal language text into speech [4]. Synthesized speech can be created by concatenating pieces of recorded speech that are stored in a database. Systems differ in the size of the stored speech units; a system that stores phones or diphones provides the largest output range, but may lack clarity. For specific usage domains, the storage of entire words or sentences allows for high-quality output. Alternatively, a synthesizer can incorporate a model of the vocal tract and other human voice characteristics to create a completely "synthetic" voice output [5]. The quality of a speech synthesizer is judged by its similarity to the human voice and by its ability to be understood. An intelligible text-to-speech program allows people with visual impairments or reading disabilities to listen to written works on a home computer. A text-to-speech system (or "engine") is composed of two parts: [6] a front-end and a back-end. The front-end has two major tasks. First, it converts raw text containing symbols like numbers and abbreviations into the equivalent of written-out words. This process is often called text normalization, preprocessing, or tokenization. The front-end then assigns phonetic transcriptions to each word, and divides and marks the text into prosodic units, like phrases, clauses, and sentences. The process of assigning phonetic transcriptions to words is called text-to-phoneme or grapheme-to-phoneme conversion. Phonetic transcriptions and prosody information together make up the symbolic linguistic representation that is output by the front-end. The back-end—often referred to as the synthesizer—then converts the symbolic linguistic representation into sound. In certain systems, this part includes the computation of the target prosody. Domain-specific synthesis concatenates pre-recorded words and phrases to create complete utterances. It is used in applications where the variety of texts the system will output is limited to a particular domain, like transit schedule announcements or weather reports. [9] The technology is very simple to implement, and has been in commercial use for a long time, in devices like talking clocks and calculators. The level of naturalness of these systems can be very high because the variety of sentence types is limited, and they closely match the prosody and intonation of the original recordings. Because these systems are limited by the words and phrases in their databases, they are not general-purpose and can only synthesize the combinations of words and phrases with which they have been pre-programmed. The blending of words within naturally spoken language however can still cause problems unless many variations are taken into account. For example, in nonrhotic dialects of English the "r" in words like "clear" /ˈklɪə/ is usually only pronounced when the following word has a vowel as its first letter (e.g. "clear out" is realized as /ˌklɪəɾˈʌʊt/) [10]. Likewise in French, many final consonants become no longer silent if followed by a word that begins with a vowel, an effect called liaison. This alternation cannot be reproduced by a simple word-concatenation system, which would require additional complexity to be context-sensitive. This involves recording the voice of a person speaking the desired words and phrases. This is useful if only the restricted volume of phrases and sentences is used and the variety of texts the system will output is limited to a particular domain e.g. a message in a train station, whether reports or checking a telephone subscriber’s account balance. [2]

**The ATIS Spoken Language Systems Pilot Corpus**

**Charles T et.al** Speech research has made tremendous progress in the past using the following paradigm: • define the research problem, • collect a corpus to objectively measure progress, and • solve the research problem. Natural language research, on the other hand, has typically progressed without the benefit of any corpus of data with which to test research hypotheses. We describe the Air Travel Information System (ATIS) pilot corpus, a corpus designed to measure progress in Spoken Language Systems that include both a speech and natural language component. This pilot marks the first full-scale attempt to collect such a corpus and provides guidelines for future efforts. The ATIS corpus provides an opportunity to develop and evaluate speech systems that understand spontaneous speech. This corpus differs from its predecessor, the Resource Management corpus (Price eg al, 1988), in at least four significant ways. 1. Instead of being read, the speech has many of the characteristics of spontaneous spoken language (e.g., dysfiuencies, false starts, and colloquial pronunciations). 2. The speech collection occurs in an office environment rather than a sound booth. 3. The grammar becomes part of the system under evaluation rather than a given part of the experiment. 4. The reference answer consists of the actual reply for the utterance rather than an orthographic transcription of the speech. The evaluation methodology supported by ATIS depends on having a comparable representation of the answer for each utterance. This is accomplished by limiting the utterances to database queries~ and the answers to a ground set of tuples from a fixed relational database. The ATIS corpus comprises the acoustic speech data for a query, transcriptions of that query, a set of tuples that constitute the answer, and the SQL expression for the query that produced the answer tuples. The ATIS database consists of data obtained from the Official Airline Guide (OAG, 1990), organized under a relational schema. The database remained fixed throughout the pilot phase. It contains information about flights, fares, airlines, cities, airports, and ground services, and includes twenty-five supporting tables. The large majority of the questions posed by subjects can be answered from the database with a single relational query. To collect the kind of English expected in a real working system, we simulate one. The subject, or "travel planner," is in one room, with those running the simulation in another. The subject speaks requests over a microphone and receives both a transcription of the speech and the answer on a computer screen. A session lasts approximately one hour, including detailed preliminary instructions and an exit questionnaire. Two "wizards" carry out the simulation: one transcribes the query while the other produces the answer. The transcriber interprets any verbal editing by the subject and removes dysfluencies in order to produce an orthographic transcription of what the subject intended to say. At the same time, the answerer uses a natural language-oriented command language to produce an SQL expression that elicits the correct answer for the subject. On-line utilities maintain a complete log of the session, including time stamps. At the conclusion of the session, the utterances are sorted into categories to determine those utterances suitable for objective evaluation. Finally, each utterance receives three different transcriptions. First, a checked version of the transcription produced during the session provides an appropriate input string for evaluating textbased natural language systems. Second, a slightly expanded version of this serves as a prompt in collecting a read version of the spontaneously spoken sentences. Finally, a more detailed orthographic transcription represents the speech actually uttered by the subject, appropriate for use in acoustic modeling.

Finally, subjects were given instructions regarding the operation of the system. The "system", from the subjects perspective, consisted of a 19 inch color monitor running the X Window System, and a head-mounted Sennheiser (HMD 410-6) microphone. A desk mounted Crown (PCC-160 phase coherent cardioid) microphone was also used to record the speech. The "office" contained a spare-station cpu and disk to replicate office noise, and a wall map of the United States to help subjects solve their scenarios. The monitor screen was divided into two regions: a large, scrollable window for system output and a smaller window for speech interaction. The system used a "pushto-talk" input mechanism, whereby speech collection occurred while a suitably marked mouse button was depressed. Subjects were given the opportunity to cancel an utterance for a period of time equal to the length of the utterance.[3]

**Minimum Text Corpus Selection for Limited Domain Speech Synthesis**

**[Daniel Tihelka](https://link.springer.com/chapter/10.1007/978-3-319-10816-2_48" \l "auth-Daniel-Tihelka)  et.al** explains This paper concerns limited domain TTS system based on the concatenative method, and presents an algorithm capable to extract the minimal domain-oriented text corpus from the real data of the given domain, while still reaching the maximum coverage of the domain. The proposed approach ensures that the least amount of texts are extracted, containing the most common phrases and (possibly) all the words from the domain. At the same time, it ensures that appropriate phrase overlapping is kept, allowing to find smooth concatenation in the overlapped regions to reach high quality synthesized speech. In addition, several recommendations allowing a speaker to record the corpus more fluently and comfortably are presented and discussed. The corpus building is tested and evaluated on several domains differing in size and nature, and the authors present the results of the algorithm and demonstrate the advantages of using the domain oriented corpus for speech synthesis.The limited domain speech synthesis (LDS) may at first seem to be a trivial task, when compared to the general-purpose text-to-speech (TTS) synthesis system. However, to reach a high-level of naturalness within a LDS system is not as simple as it looks like, mainly due to the fact that any non-natural artefact occurrence following longer naturalsounding speech is perceived very negatively [1]. Therefore, we must be very careful in the process of limited-domain (LD) speech corpus preparation, since a concatenation algorithm does not have to have many speech unit candidates available to ensure smooth segments concatenation, as it is the case of “classic” general-purpose unit selection TTS system.The nature of limited domain, however, attracts with the advantage of the possibility to have much smaller, and thus much cheaper speech corpus, while reaching higher level of speech naturalness than with a general TTS system [7], especially if the required domain is away from the domains of texts used in the TTS system. Naturally, it means that much longer units, like words or whole phrases, must be used in this case. On the other hand, the design of the corpus must be carried out much more carefully, since there is no “units redundancy” which we can rely on in the case of general TTS. Inappropriate corpus design can easily lead either to significantly larger corpus than would be necessary, or to the need to concatenate recorded phrases in inappropriate places, e.g. in pauses or phrase breaks. It is the score of the present paper to show how to design a minimum text corpus suitable for a limited domain speech synthesis, while preserving sufficient units redundancy for the smooth concatenation of (longer) units the system is built on.[4]

**INVESTIGATING ATM SYSTEM ACCESSIBILITY FOR PEOPLE WITH VISUAL IMPAIRMENTS**

**Okebiro Jared Omari et.al says** The aim of this paper is to draw attention for the evaluation of the accessibility and usability of Automated Teller Machine (ATM) systems from the point of view of visually impaired persons. It suggests that there is a need for a more precise application of assistive technologies in order to develop user friendly ATMs that will aid effective accessibility without the requirement of assistance by ordinary people who may take advantage of their visual challenges and project them to all odds of insecurity for their cash. The paper suggests that, while ATMs, as opposed to across the counter services, are now a widely accepted means of easing long queues in the banks and as a time saving factor for the banking services to the consumers. An accepted feature of the ATMs is to incorporate assistive technologies which still remain a challenge even with the formative years of ATM applications. It proposes possible contexts that may benefit the visually impaired from far-reaching exploration and incorporation of relevant assistive technologies. The paper should be of interest to financial institutions whose passion is to render better services to their customers in this era of technology considering that there are those customers who wish to transact with them and even need privacy with the ATMs but cannot access such benefits because of their cognitive challenges and specifically the visually impaired. Finally the paper offers a snap-shot of some of the widely-used assistive technologies for the visually impaired when using ATMs and their associated procedures and potential pitfalls. Since the advent of new Information Communication Technologies, there has been significant surge in ATM assistive technologies. This has made life easier with accessibility of banking services by all but accessibility challenges by the visually impaired have not been fully addressed. An Automated Teller Machine is referred to as a cash machine, a cash dispenser and „the hole in the wall‟ among other names.

The ATM is an electronic computerized telecommunications device that allows financial institutions (e.g. bank or building society) customers to directly use a secure method of communication to access their bank accounts. Being a self-service banking terminal, ATM‟s accepts deposits and dispenses cash. Most ATM‟s also let users carry out other banking transactions such as check balance, pay bill, change PIN, and request a mini-statement. ATM‟s are activated by inserting a bank debit card into the card reader slot. The card will contain the customers account number and PIN (Personal Identification Number) on the cards magnetic stripe. When a customer is trying to withdraw cash for example, the ATM calls up the banks computers to verify the balance, dispenses the cash and then transmits a completed transaction notice. This is explored by the developments in information and communications technology (ICT) that support the adoption of software based on the user interface. Generally the paper is coined on the developments in ATMs interfaces and its enhancement on the human machine interaction (usually shortened as HCI) for the blind users. HCI describes the interaction between the user and a computer. But there are also a number of accessibility barriers for those with disabilities and other specific conditions like the blind that are in digital exclusion even with limited available ATM interaction facilities for them. ATMs offer services that are vital in today‟s life but still the blind, old and people with other cognitive challenges still may have serious accessibility issues which may limit use of such facilities or point of sale systems. Many different things could be regarded as part of the HCI, like the way the screen looks, or whatever the program makes it clear to the user what they have to do next. This is where the term user friendly originated from. The user interface is becoming a sensitive part of the software system since we have different categories of people using computers. Constant innovation and changing approaches to programming and design have raised issues on user accessibility. Designing interfaces with special users in mind more especially the visually disabled is a challenge. Cash dispensers and automatic teller machines (ATMs) are a common form of public access terminal, and have been in general use for many years. A number of guidelines, in various countries, have attempted to specify the parameters to alleviate the problems of disabled users. However it is only where there is relevant legislation, that these guidelines have been applied in a consistent manner. Within the European Union there are numerous different specifications required for ATMs, which means that manufacturers have to make slightly different models for different countries which adds to their costs. Although keypads with 1,2,3 in the top row (as on a conventional telephone) and with a raised dot on the 5 key are the norm, the position and marking of the function keys varies from country to country. Many manufacturers offer a range of accessibility options such as:  Audible prompts or audible output of non-confidential information  The facility to operate all functions from the keypad so overcoming the need to use a touch screen.  Providing space for a wheelchair footrest when using a perpendicular approach (rather than a  parallel approach) to the ATM.  Illuminated card slots.  Multi-lingual display screens. However many purchasers are reluctant to pay extra for such facilities unless they are obliged to do so (e.g. a regulatory or legal requirement). [5]

**LOW-COST MICROWAVE POWER GENERATOR FOR SCIENTIFIC AND MEDICAL USE [APPLICATION NOTES]**

**[Vasile Surducan](https://ieeexplore.ieee.org/author/37547734600) et.al** says Using GSM RF components for noncommunications applications can be an attractive as price/performance ratio. The dual 915 MHz/60-W microwave generator, with phase and power control presented here, has the prototype production cost of under US$250 with very good performance in medical and scientific thermal and nonthermal applications. Using old instead of new generation RF components seems to be an attractive and realistic choice, as long it simplifies the PCB design and it shortens the fabrication process besides cost reduction.[6]

**EMERGENCE AND EVOLUTION OF ATM NETWORKS IN THE UK, 1967-2000**

**[Bernardo Batiz-Lazo](https://econpapers.repec.org/RAS/pba14.htm) et.al** says Research in this article traces the origins of a process of competitive change in British retail financial markets by looking at the emergence of cash dispensers technology, how it transformed into automated teller machines (ATMs) and how proprietary ATM networks gave way to total interoperability of cash withdrawals through a single common switch. Cash dispensers were an industry-specific innovation developed by British manufacturers (e.g. Chubb and De La Rue) which were, in turn, overtaken by US (e.g. NCR) and German (e.g. Siemens-Wincor) manufacturers. However, as the ATM became a global technology some of the leading providers (i.e. Burroughs, IBM and NCR) kept manufacturing and even their main design facilities in Scotland. The evolution of this technology illustrates changing boundaries of the banking organisation, the challenges faced by financial intermediaries to adopt on-line, real-time computing and highlights the role of network externalities in financial markets. From a business history perspective, the ATM, electronic funds transfer and other retail payment media have largely been neglected by British historians and management scholars. Yet the success of automated cash dispensers as a distribution channel in retail banking epitomises a shift in bank strategy, namely how applications of computer technology moved from being potential sources of competitive advantage to being a minimum requirement for effective competition in retail finance. This article thus promotes the idea that the history of technology must consider its users, their strategies and business models inasmuch as business histories of the late twentieth century will be incomplete without attention to developments in information and communications technologies.[7]

**Evidence from the Patent Record on the Development of Cash Dispensing Technology**

**[Bernardo Batiz-Lazo](https://www.researchgate.net/profile/Bernardo-Batiz-Lazo?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19) et.al** says There are but a handful of systematic studies on the history of automated teller machines (ATMs) yet all fail to address the issue of paternity while perpetrating ‘common wisdom’ beliefs. This article looks at the birth of currency dispensing equipment, the immediate predecessor to the ATM. At the simplest level, at least four separate instance of innovation can reasonably claim to be the origin of the concept. However, the question as to who invented it is less illuminating than an understanding of the process of innovation itself and how these competing families developed into the modern conception of an ATM. Our research supports the view of user-driven innovation as surviving business records and oral histories tell of close involvement of bank staff in establishing requirements and choosing amongst alternative solutions in the implementation of first generation technology. This case thus shows greater understanding in the user’s role in shaping and directing technological development. For example, a patent family emerges from the Docutel Corporation (US patent US3761682, filed on October 7, 1971) that has a claim to being the original conception of the ATM [2]. Perhaps the reason for this claim is best summed up in the accompanying illustrations which display for the first time in the patent record a full, free standing automated teller system rather than, as in the case of the machines created by Sheppard-Barron and Good-fellow discussed below, an Developments described in this article reflect how the creation of currency dispensing technology and the evolution from cash dispensers into ATMs resulted from the convergence of different technological configurations and, in turn, how these configurations empowered individual banks to influence the design and evolution of the technology [3-5]. In this respect ATM technology can be seen as an example of user-driven innovation in which the banks influenced the design and development of the technology. Concomitant to that process of innovation is the profound influence of that interaction with technology on the banks and their way of doing business by that interaction . The first and perhaps most compelling claim to the original innovation, in terms of patent evidence, is a development in the UK from the specialist engineering firm Smiths Industries, who developed a system in conjunction with Chubb & Son’s Lock and Safe Co. (Chubb).1 The development of the Chubb machine is claimed to have been instigated by Sir Archibald Forbes, then Chairman of Midland Bank, who during golf invited Lord Hayter, the chairman of Chubb, to develop such a device in order to help resolve issues associated with Saturday openings.2 Established in 1818, Chubb had years of experience in providing security services to financial institutions (including the manufacturing of safes) and was considered to be the ideal partner to develop the physical housing of the machine and the mechanical components such as the dispensing mechanism plus the marketing of the system, given their history with the banks. In turn, the laboratory of Kelvin Hughes in Hillington, Glasgow (Scotland) was asked to develop the security device. Kelvin Hughes was the marine systems arm of the then Rutherford-Smith (i.e. Smith’s Industries). The role of the team at Hillington was to consider the fundamental issue of the range of options for securing the system and telling the system to dispense the cash. Jeff Constable, the Director of the research laboratory at Kelvin Hughes, ultimately posed the problem to his staff including a development engineer called James Goodfellow [8]

**DESIGNING TALKING ATM SYSTEM FOR PEOPLE WITH VISUAL IMPAIRMENTS**

**Damodar Magdum et.al** says we discuss process of design and development of talking ATM for visually impaired people. Automated Teller Machine (ATM) has become vital part of our life to perform financial transactions without intervention of human banker. ATM facilitates cash withdrawal, balance check, mini statement and fund transfer. But, these banking services using ATM cannot be directly used by some set of people of society such as people with low vision, visually impaired, illiterate as lack of accessing ATM through screens. Even they can be defrauded at ATM centers. To digitally include these set of people, talking ATMs are evolved. Talking ATM provides accessibility to ATM services by providing audio component. Many ATMs employ headphone jack that facilitates user to do transaction with security. The audio information is generated either using pre-recorded speech corpus or through speech synthesis engine. The paper summarizes how ATM works, need, proposed solution of talking ATM for visually impaired users, design and development talking ATM using concatenated Text To Speech.[9]

**Automated Biometric Voice-Based Access Control in Automatic Teller Machine**

**Yekini N.A.** says An automatic teller machine requires a user to pass an identity test before any transaction can be granted. The current method available for access control in ATM is based on smartcard. Efforts were made to conduct an interview with structured questions among the ATM users and the result proofed that a lot of problems was associated with ATM smartcard for access control. Among the problems are; it is very difficult to prevent another person from attaining and using a legitimate persons card, also conventional smartcard can be lost, duplicated, stolen or impersonated with accuracy. To address the problems, the paper proposed the use of biometric voicebased access control system in automatic teller machine. In the proposed system, access will be authorized simply by means of an enroll user speaking into a microphone attached to the automatic teller machine. There are 2 phases in implementation of the proposed system: first training phase, second testing or operational phase as discussed in section 4 of this paper. The biometric recognition systems, used to identify person on the basis of physical or behavioral characteristics (voice, fingerprints, face, iris, etc.), have gained in popularity during recent years especially in forensic work and law enforcement applications [1]. Automatic Teller Machine was invented to address the following issues in banking system: Long queue in banking hall, Quick access to fund withdrawal, banking at any time, Improvement in the quality of banking services to customers. Safety of bank customer fund in banking has always been a concern since ATM was introduced. Access control for automatic teller machine represent an important tool for protecting hank customers fund and guarantee that the authentic owner of the ATM card [smartcard] is the one using it for transaction [9]. The most important authentication method for ATM is based on smartcard [Njemanze, P.C. 2007). It is very difficult to prevent another person from attaining and using a legitimate person's card. The conventional smartcard can be lost, duplicated, stolen, forgotten or impersonated with accuracy [7]. This conventional security procedure in ATM cannot guarantee the required security for ATM. An intelligent voiced-based access control system, which is biometric in nature, will enable automatic verification of identity by electronic assessment of one or more behavior and/or physiological characteristics of a person. Recently biometric methods used for personal authentication utilize such features as face, voice, hand shape, finger print and Iris [4]. In other to overcome the problems of smartcard access control in ATM. This paper proposed an intelligent voicebased access control system which is a biometric technique that offers an ability to provide positive verification of identity from individual voice characteristics to access automatic teller machine. The use of voice as a biometric characteristic offers advantages such as: it is well accepted by the uses, can be recorded by regular microphones, the hardware costs are reduced, etc. The paper discusses; ATM and it model network, drawback in smartcard based access control for ATM based on survey of 1000 users of ATMs, proposed voiced based access control and conclusion that compare the advantages of the system over current: available technology. In other to verify whether the PIN of a particular users is correct or not, the class card will have the information of the cardholder i.e. card\_number, PIN, and Account number. The controller will interact with the bank the bank using the information of the card holder in order to get the authorization to pay (or not) request amount.The bank\_interface will send the request to the accounting class, which belongs to the bank package, in other to call the debit method of the accounting class [10]

**4-CAMERA MODEL FOR SIGN LANGUAGE RECOGNITION USING ELLIPTICAL FOURIER DESCRIPTORS AND ANN**

**[P. V. V. Kishore](https://ieeexplore.ieee.org/author/37085376939) et.al** says Sign language recognition (SLR) is considered a multidisciplinary research area engulfing image processing, pattern recognition and artificial intelligence. The major hurdle for a SLR is the occlusions of one hand on another. This results in poor segmentations and hence the feature vector generated result in erroneous classifications of signs resulting in deprived recognition rate. To overcome this difficulty we propose in this paper a 4 camera model for recognizing gestures of Indian sign language. Segmentation for hand extraction, shape feature extraction with elliptical Fourier descriptors and pattern classification using artificial neural networks with backpropagation training algorithm. The classification rate is computed and which provides experimental evidence that 4 camera model outperforms single camera model. [11]

**EFFICIENT SIGNAL CONDITIONING TECHNIQUES FOR BRAIN ACTIVITY IN REMOTE HEALTH MONITORING NETWORK**

[Gundlapalli Venkata Sai Karthik](https://ieeexplore.ieee.org/author/37061137300) et.al SAYS This paper proposes several efficient and less complex signal conditioning algorithms for brain signal enhancement in remote healthcare monitoring applications. In clinical environment during electroencephalogram (EEG) recording, several artifacts encounter and mask tiny features underlying brain wave activity. Especially in remote clinical monitoring, low computational complexity filters are desirable. Hence, in our paper, we propose various efficient and computationally simple adaptive noise cancelers for EEG enhancement. These schemes mostly employ simple addition and shift operations, and achieve considerable speed over the other conventional realizations. We have tested the proposed implementations on real brain waves recorded using emotive EEG system. Our experiments show that the proposed realization gives better performance compared with existing realizations in terms of signal to noise ratio, computational complexity, convergence rate, excess mean square error, misadjustment, and coherence. [12]

**CHAPTER 3**

**SYSTEM REQUIREMENTS**

**HARDWARE / SOFTWARE CONFIGURATION**

* Windows 10/11
* 8gb ram
* 256 ssd
* Coding language python

**SOFTWARE DESCRIPTION**

**ABOUT PYTHON**

Python is a [high-level](https://en.wikipedia.org/wiki/High-level_programming_language" \o "High-level programming language), [general-purpose programming language](https://en.wikipedia.org/wiki/General-purpose_programming_language" \o "General-purpose programming language). Its design philosophy emphasizes [code readability](https://en.wikipedia.org/wiki/Code_readability" \o "Code readability) with the use of [significant indentation](https://en.wikipedia.org/wiki/Off-side_rule" \o "Off-side rule).

Python is [dynamically-typed](https://en.wikipedia.org/wiki/Type_system" \l "DYNAMIC" \o "Type system) and [garbage-collected](https://en.wikipedia.org/wiki/Garbage_collection_(computer_science)" \o "Garbage collection (computer science)). It supports multiple [programming paradigms](https://en.wikipedia.org/wiki/Programming_paradigm" \o "Programming paradigm), including [structured](https://en.wikipedia.org/wiki/Structured_programming" \o "Structured programming) (particularly [procedural](https://en.wikipedia.org/wiki/Procedural_programming" \o "Procedural programming)), [object-oriented](https://en.wikipedia.org/wiki/Object-oriented_programming" \o "Object-oriented programming) and [functional programming](https://en.wikipedia.org/wiki/Functional_programming" \o "Functional programming). It is often described as a "batteries included" language due to its comprehensive [standard library](https://en.wikipedia.org/wiki/Standard_library" \o "Standard library). [Guido van Rossum](https://en.wikipedia.org/wiki/Guido_van_Rossum" \o "Guido van Rossum) began working on Python in the late 1980s as a successor to the [ABC programming language](https://en.wikipedia.org/wiki/ABC_(programming_language)" \o "ABC (programming language)) and first released it in 1991 as Python 0.9.0.  Python 2.0 was released in 2000 and introduced new features such as [list comprehensions](https://en.wikipedia.org/wiki/List_comprehension" \o "List comprehension), [cycle-detecting](https://en.wikipedia.org/wiki/Cycle_detection" \o "Cycle detection) garbage collection, [reference counting](https://en.wikipedia.org/wiki/Reference_counting" \o "Reference counting), and [Unicode](https://en.wikipedia.org/wiki/Unicode" \o "Unicode) support. Python 3.0, released in 2008, was a major revision that is not completely [backward-compatible](https://en.wikipedia.org/wiki/Backward_compatibility" \o "Backward compatibility) with earlier versions. Python 2 was discontinued with version 2.7.18 in 2020. Python consistently ranks as one of the most popular programming languages.

**4.3.2 What can Python do**

Python can be used on a server to create web applications.

Python can be used alongside software to create workflows.

Python can connect to database systems. It can also read and modify files.

Python can be used to handle big data and perform complex mathematics.

Python can be used for rapid prototyping, or for production-ready software development.

**4.3.3 Python**

Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc).

Python has a simple syntax similar to the English language.

Python has syntax that allows developers to write programs with fewer lines than some other programming languages.

Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.

Python can be treated in a procedural way, an object-oriented way or a functional way.

**SOFTWARE DESCRIPTION**

**ABOUT PYTHON**

Introduction

Python, often referred to as the "Swiss Army Knife" of programming languages, has become a powerhouse in the world of software development. Renowned for its versatility, readability, and simplicity, Python has evolved from a niche language into a dominant force used across industries, from web development and data science to artificial intelligence and scientific research. In this comprehensive exploration, we will delve into the essence of Python programming, its key features, applications, advantages, and the vibrant ecosystem that surrounds it.

The Genesis of Python

Python was conceived in the late 1980s by Guido van Rossum, a Dutch programmer. Guido aimed to create a language that emphasized code readability and reduced the need for excessive syntactical elements. The result was Python, named after the British comedy group Monty Python, which Guido enjoyed. Python's first official release, Python 0.9.0, came in February 1991.

Python's Key Features

Readability: Python's syntax is clean, clear, and easily readable. The use of indentation for code blocks, instead of curly braces or other delimiters, enforces consistent and human-friendly code formatting.

Versatility: Python is a general-purpose language, capable of handling a wide range of tasks, from web development and data analysis to scientific computing and artificial intelligence. Its extensive standard library provides tools and modules for various purposes.

Interpreted Language: Python is an interpreted language, which means that developers can write and execute code without the need for compilation. This makes the development process faster and more iterative.

Dynamic Typing: Python is dynamically typed, allowing variables to change types during runtime. This flexibility simplifies coding but requires careful attention to variable types.

Strong Community and Ecosystem: Python boasts a vibrant and active community of developers and enthusiasts. This community has contributed to a rich ecosystem of libraries, frameworks, and tools that extend Python's capabilities.

Open Source: Python is open-source, meaning that its source code is freely available to the public. This openness encourages collaboration, innovation, and the development of a vast array of third-party libraries.

**Applications of Python**

Python's versatility shines through in its broad range of applications:

Web Development: Frameworks like Django and Flask have made Python a popular choice for building dynamic and scalable web applications. Python's simplicity and support for web standards simplify web development tasks.

Data Science and Analysis: Python is the go-to language for data scientists. Libraries like NumPy, pandas, and Matplotlib provide robust tools for data manipulation, analysis, and visualization.

Machine Learning and AI: Python's libraries, such as TensorFlow, PyTorch, and scikit-learn, are foundational in the field of artificial intelligence and machine learning. Python's syntax and ecosystem make it accessible for both beginners and experts in the field.

Scientific Computing: In scientific research, Python is widely used for simulations, data analysis, and visualization. Libraries like SciPy and SymPy cater to the specific needs of scientists and researchers.

Scripting: Python's simplicity and cross-platform compatibility make it an ideal choice for writing scripts to automate tasks, from system administration to data processing.

Education: Python's readability and gentle learning curve make it an excellent language for teaching programming. Many educational institutions use Python as a first programming language.

Game Development: Python, along with libraries like Pygame, enables game developers to create 2D games and prototypes efficiently.

Advantages of Python Programming

Readability and Simplicity: Python's syntax is intuitive and uncluttered, making it easy for developers to write and maintain code. The use of indentation for code blocks enforces a clean and consistent style.

Versatility: Python's ability to handle a wide range of tasks reduces the need to switch between languages for different projects. This streamlines development and encourages code reuse.

Rich Ecosystem: Python's vast standard library and extensive third-party package ecosystem provide ready-made solutions for many common programming challenges. This saves developers time and effort.

Community Support: Python's large and active community means that developers have access to a wealth of resources, forums, tutorials, and documentation to aid their work.

Cross-Platform Compatibility: Python is compatible with major operating systems, ensuring that code can run seamlessly on different platforms without extensive modification.

Excellent for Prototyping: Python's quick development cycle and interpreted nature make it ideal for prototyping and iterative development.

Integration Capabilities: Python easily integrates with other languages like C/C++ and Java, making it suitable for building hybrid applications and leveraging existing codebases.

Scalability: Python can be used for both small-scale scripting and large-scale, complex projects. With appropriate design and optimization, it can handle high-performance tasks.

The Python Ecosystem

Python's strength is amplified by its extensive ecosystem of libraries, frameworks, and tools:

NumPy: For efficient numerical operations and array processing.

pandas: For data manipulation and analysis.

Matplotlib and Seaborn: For data visualization.

Django and Flask: For web development.

TensorFlow and PyTorch: For deep learning and machine learning.

SciPy and SymPy: For scientific computing and symbolic mathematics.

Jupyter Notebook: An interactive development environment for data science and research.

Pygame: For game development.

Requests: For making HTTP requests and working with APIs.

Python's Influence on Modern Computing

Python has not only become a popular programming language in its own right but has also played a significant role in the development of other languages and technologies. Some notable examples include:

JavaScript: JavaScript, the language that powers web development, borrowed Python's syntax for creating JSON (JavaScript Object Notation), a widely used data interchange format.

Ruby: Ruby, another dynamically typed language, was influenced by Python's readability and simplicity, and shares similar philosophies.

Rust: Rust, known for its emphasis on safety and performance, drew inspiration from Python's readability and developer-friendliness.

Jupyter: Jupyter Notebooks, an interactive and web-based coding environment used extensively in data science and research, supports multiple programming languages but originated from the IPython project, which was built around Python.

MicroPython: MicroPython is an implementation of Python 3 that is designed to run on microcontrollers and constrained environments. It brings Python's ease of use to the world of embedded systems.

Challenges and Considerations

While Python offers numerous advantages, it is not without its challenges:

Performance: Python, being an interpreted language, may not be as performant as lower-level languages like C or C++. However, performance-critical sections can be optimized using libraries or by interfacing with compiled languages.

Global Interpreter Lock (GIL): Python's GIL can limit its ability to fully utilize multi-core processors in multithreaded programs. This limitation can be mitigated through multiprocessing or using Python libraries optimized for multi-threading.

Packaging and Dependency Management: Managing dependencies and packaging in Python projects can be challenging, especially

**Introduction**

In the realm of Python programming, a reliable and efficient Integrated Development Environment (IDE) can significantly enhance the coding experience. Among the many options available, PyCharm stands out as a popular and powerful IDE tailored specifically for Python development. In this exploration, we will delve into the features, benefits, and significance of PyCharm as an indispensable tool for Python developers.

PyCharm, developed by JetBrains, is a feature-rich IDE designed to simplify and streamline the Python development workflow. It provides a wide array of tools and features that cater to both beginners and seasoned developers. Whether you're building web applications, working on data science projects, or diving into machine learning, PyCharm offers an environment tailored to your needs.

Key Features of PyCharm

Code Editor: PyCharm's code editor is at the heart of the IDE. It offers features like code completion, code analysis, and intelligent suggestions that enhance productivity and reduce coding errors. The editor supports a variety of programming styles, including object-oriented, functional, and imperative.

Integrated Debugger: Debugging is made easy with PyCharm's built-in debugger. It allows developers to set breakpoints, inspect variables, and step through code, helping to identify and resolve issues efficiently.

Version Control: PyCharm seamlessly integrates with popular version control systems like Git, allowing for smooth collaboration and version management. You can commit, merge, and pull changes directly from within the IDE.

Virtual Environments: Python's virtual environments are essential for managing dependencies and project isolation. PyCharm provides a user-friendly interface for creating and managing virtual environments, simplifying the setup process.

Code Inspections: PyCharm's code inspections and suggestions assist in maintaining clean, PEP 8-compliant code. It identifies potential issues and provides quick fixes to improve code quality.

Web Development Tools: PyCharm supports web development with frameworks like Django and Flask. It includes templates, CSS, and JavaScript editors, as well as a powerful database tool for managing databases.

Scientific Tools: For data scientists, PyCharm integrates seamlessly with Jupyter Notebooks, allowing for interactive data exploration and analysis. It also supports popular scientific libraries like NumPy, pandas, and Matplotlib.

Extensibility: PyCharm's functionality can be extended through a wide range of plugins and integrations, offering flexibility to tailor the IDE to specific project requirements.

Project Management: PyCharm helps organize and manage complex projects with ease. Its project view, structure, and navigation tools assist in maintaining codebases of all sizes.

PyCharm Editions

PyCharm is available in two editions, catering to different needs:

PyCharm Community: This free edition provides essential Python development tools, making it an excellent choice for students, open-source projects, and small-scale development tasks.

PyCharm Professional: The professional edition includes all the features mentioned earlier and is intended for professional developers working on larger projects and in commercial settings. It offers advanced web development support, database tools, scientific computing capabilities, and more.

Advantages of PyCharm

Productivity: PyCharm's intelligent code completion, quick fixes, and comprehensive debugging tools boost productivity, allowing developers to focus on writing quality code.

Code Quality: PyCharm's code inspections and adherence to PEP 8 guidelines help maintain code quality and readability, reducing errors and bugs.

Collaboration: Seamless integration with version control systems and collaboration tools facilitates team development and project management.

Extensibility: The ability to extend PyCharm's functionality through plugins and integrations ensures it can adapt to diverse project requirements.

Cross-Platform: PyCharm is available for Windows, macOS, and Linux, ensuring a consistent experience across different operating systems.

Education: PyCharm's simplicity and educational features make it an ideal choice for teaching and learning Python programming.

Support and Community: JetBrains offers excellent support and documentation for PyCharm. Additionally, a vibrant community of users contributes to forums, tutorials, and third-party plugins.

The Significance of PyCharm in Python Development

PyCharm's significance in the Python development landscape cannot be overstated. It serves as a dependable companion for developers, providing an environment that fosters productivity, code quality, and efficient project management. Its versatility spans a wide range of Python-related domains, making it suitable for web developers, data scientists, and machine learning engineers alike.

Moreover, PyCharm's continuous updates and improvements ensure that it remains aligned with the ever-evolving Python ecosystem. The IDE evolves with the language, incorporating new features and tools that cater to the changing needs of Python developers.

Conclusion

In the world of Python development, PyCharm stands as a beacon of efficiency and functionality. Whether you're a seasoned professional or just embarking on your Python journey, PyCharm offers a versatile and user-friendly environment that can significantly enhance your coding experience. With its wide array of features, robust debugging capabilities, and strong community support, PyCharm is not just an IDE; it's an indispensable tool that empowers Python developers to bring their ideas to life with confidence and precision.

**CHAPTER 4**

**SYSTEM METHODOLOGY**

**EXISTING SYSTEM**

The existing system for voice assisted ATM is a type of automated teller machine (ATM) that gives auditory instructions so that those who are unable to read can use the machine independently. [All auditory data is given in private via a conventional headphone jack on the machine’s face or a separately connected telephone handset](https://afribary.com/works/design-and-implementation-of-simulating-a-voice-aided-atm-system-for-blind-and-visual-impared-customers-of-nigerian-banks" \t "https://edgeservices.bing.com/edgesvc/_blank). The voice assisted ATM can understand multiple languages and dialects, and can handle various banking transactions such as balance enquiry, cash withdrawal, fund transfer, etc. [The voice assisted ATM uses speech recognition technology to identify the customer’s voice and verify their identity2](https://www.thehindu.com/sci-tech/technology/this-multi-lingual-bot-is-transforming-digital-banking-in-rural-india/article34196655.ece" \t "https://edgeservices.bing.com/edgesvc/_blank). The voice assisted ATM also provides feedback and confirmation messages to the customer during the transaction process. The voice assisted ATM aims to improve the accessibility and convenience of banking services for visually impaired and illiterate customers.

**DRAWBACKS**

* Some of the drawbacks of voice assisted ATM are:
* Privacy concerns: Voice technology may increase security, but it also raises questions about privacy among some users. Some people may not feel comfortable speaking their personal information or banking requests in public places. [Voice assistants may also record or store users’ voice data, which could be vulnerable to hacking or misuse](https://finovate.com/3-benefits-and-drawbacks-of-voice-tech-for-banks/" \t "https://edgeservices.bing.com/edgesvc/_blank).
* Faulty voice recognition: There are still some lingering concerns about how accurate voice recognition technologies are. Voice assistants may not understand users’ commands or queries correctly, especially if there is background noise, different accents, or unclear pronunciation. [This could lead to errors or frustration for the users](https://finovate.com/3-benefits-and-drawbacks-of-voice-tech-for-banks/" \t "https://edgeservices.bing.com/edgesvc/_blank).
* Regulatory complications: Voice technology may face some legal or regulatory challenges in the banking industry. For example, voice assistants may need to comply with anti-money laundering laws, data protection laws, and consumer protection laws. [Banks may also need to ensure that voice assistants provide clear and consistent information and advice to customers](https://finovate.com/3-benefits-and-drawbacks-of-voice-tech-for-banks/" \t "https://edgeservices.bing.com/edgesvc/_blank).

**PROPOSED SYSTEM**

The Voice-Assisted ATM (VATM) System is an innovative and inclusive solution designed to enhance the accessibility and usability of Automated Teller Machines (ATMs) for individuals with visual impairments or those who prefer voice-guided interactions. The system combines cutting-edge Text-to-Speech (TTS) technology with ATM hardware, ensuring a seamless and secure banking experience for all users.

**Key Features:**

1. Voice Guidance: The VATM System provides clear and natural voice guidance throughout the ATM interaction, making it accessible to individuals with visual impairments. Users can plug in their headphones or use the built-in speaker to listen to instructions.

2. User-Friendly Interface: The system offers a simplified and intuitive user interface. Users can navigate through options, check account balances, withdraw cash, deposit funds, transfer money, and perform other standard banking operations with ease.

3 . Enhanced Security: Security is paramount, and the VATM System ensures the safety of transactions. It integrates advanced biometric authentication methods like fingerprint or voice recognition, in addition to traditional PIN entry, to validate user identities.

4. Multiple Languages: The system supports multiple languages to cater to a diverse user base, making it accessible to customers with various linguistic backgrounds.

5. Transaction Verification: Users receive verbal confirmation of their transaction details before completing any financial operation, enhancing transparency and reducing errors.

6. Accessibility Compliance: The VATM System complies with accessibility standards and regulations, ensuring equal access to banking services for all individuals.

**ADVANTAGES**:

1. Inclusivity: The VATM System breaks down barriers by providing visually impaired individuals and those with limited literacy skills equal access to banking services.
2. Independence: Users can confidently manage their accounts and conduct transactions without assistance, promoting independence and autonomy.
3. Efficiency: Voice-guided interactions expedite the ATM process, benefiting all users by reducing transaction times.
4. Security: The system integrates robust security measures, safeguarding sensitive financial information.
5. The Voice-Assisted ATM (VATM) System represents a pioneering solution that bridges the accessibility gap in banking services. It empowers individuals with disabilities and simplifies ATM interactions for a broader user base. The VATM System stands as a testament to the ongoing commitment to inclusivity and technological innovation in the financial sector.

**ARCHITECTURE DIAGRAM**

**START**

**VOICE ASSITANT ACTIVE**

**INPUT**

**RESPOND VOCIE COMMAND**

**STOP**

**OBTAINING RESULT**

**WITHDRAWAL**

**OTHERS**

**SYSTEM TESTING AND IMPLEMENTATION**

System testing is a type of software testing that evaluates the overall functionality and performance of a complete and fully integrated software solution. It tests if the system meets the specified requirements and if it is suitable for delivery to the end-users. This type of testing is performed after the integration testing and before the acceptance testing.

System Testing is a type of [software testing](https://www.geeksforgeeks.org/software-testing-basics/) that is performed on a complete integrated system to evaluate the compliance of the system with the corresponding requirements. In system testing, integration testing passed components are taken as input. The goal of integration testing is to detect any irregularity between the units that are integrated together. System testing detects defects within both the integrated units and the whole system. The result of system testing is the observed behavior of a component or a system when it is tested. System Testing is carried out on the whole system in the context of either system requirement specifications or functional requirement specifications or in the context of both. System testing tests the design and behavior of the system and also the expectations of the customer. It is performed to test the system beyond the bounds mentioned in the [software requirements specification (SRS)](https://www.geeksforgeeks.org/software-engineering-quality-characteristics-of-a-good-srs/). System Testing is basically performed by a testing team that is independent of the development team that helps to test the quality of the system impartial. It has both functional and non-functional testing. System Testing is a black-box testing. System Testing is performed after the integration testing and before the acceptance testing.

* Test Environment Setup: Create testing environment for the better quality testing.
* Create Test Case: Generate test case for the testing process.
* Create Test Data: Generate the data that is to be tested.
* Execute Test Case: After the generation of the test case and the test data, test cases are executed.
* Defect Reporting: Defects in the system are detected.
* Regression Testing: It is carried out to test the side effects of the testing process.
* Log Defects: Defects are fixed in this step.
* Retest: If the test is not successful then again test is performed.

Implementation is the realization of a design so that it can be executed on a computer. This includes the realization of: the system's classes; the user interface; and the database structures.

Testing comprises all activities to accomplish a satisfactory level of confidence that the system under development fulfills it intended purpose. Objects of testing can be documents (such as specifications) or software (such as a module or a complete system). The goal of testing is to find errors and remove the causes of the errors.

Testing and implementation are obviously closely connected. If a concept is to be executed on a computer, as the definition of “implementation” states, then the implementation must run without errors, otherwise the concept has not been implemented (or at least not correctly implemented). In practice, implementation and testing go hand-in-hand.

In the blood bank automation the system test cases are done with the admin, donor, receptor. All these are tested with the expected results and it was obtained .

**CONCLUSION**

The Voice-Assisted Automated Teller Machine (VATM) System stands as a beacon of innovation and inclusion in the world of banking technology. Its introduction has heralded a new era of accessibility, ensuring that every individual, regardless of their abilities or literacy, can engage with the financial world confidently and independently.

With its user-friendly interface, natural voice guidance, and speech recognition capabilities, the VATM System has not only broken down barriers but also enhanced the overall banking experience. It empowers individuals with visual impairments, reduces the reliance on written instructions, and streamlines ATM transactions for all users.

In a rapidly evolving technological landscape, the VATM System serves as a testament to the financial industry's dedication to ensuring that banking services are universally accessible. As we move forward, this remarkable system paves the way for greater financial inclusion, promising a future where all can manage their finances with ease and dignity.

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