Date of performance : 22/10/24

Date of submission : 30/10/24

Experiment 1

15/15

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Comps UB1-3 B div

Ubiquitous Computing (Patent)

Aim: To study a patent (System and method for recommendation in ubiquitous computing environment) related to ubiquitous computing

Metadata :

title : Ubiquitous collaboration in managed applications

app no. : 201647035068

Theory : The patent claims as :-

i) A method comprising:
Wrapping a first managed application with a collaboration feature, by a client agent. A managed mode for the first managed application

ii) The method of claim 1 further comprising:
communicating, by the client agent session information associated with the collaboration feature.

iii) The method of claim 2, wherein the rendering of the collaboration feature in combination with the second managed application

iv) The method of claim 2, where the second managed application is missing the collaboration feature.

v) The method 2 of claiming, providing the first managed app with an interface to control the rendering of the collaboration feature.

vi) The method of claim 2, comprises access by the client agent, a configuration file associated with the first managed application.

vii) The method of claim 6, wherein the rendering of the collaboration feature in combination. rendering the collaboration feature in accordance second configuration.

Summary:

The collaboration for ubiquitous computing in managed applications include methods and systems for the ubiquitous collaboration feature, in a managed application environment are described herein.

The collaboration service and/or server may store session information and one or more configuration files for use in rendering the collaboration features in combination with managed applications, executing on a users computing device.

Conclusion: Herein, we have understood the patent for ubiquitous collaboration in managed applications.

6/2/24

Experiment 2

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Aim: To develope an application for location based messages.

Theory

The term 'Ubiquitous' meaning appearing or existing everywhere, combined with computing to form the term ubiquitous computing (Ubicom) is used to describe ICT (Information and communication technology) systems that enable information and tasks to be made available everywhere, and to support intuitive human usage, appearing invisible to user.

Location based services have become increasingly popular in recent years with the rise of smartphone and other mobile devices. These services use a devices GPS or other location sensing technologies to provide user with information relevant to their current location. One such application is the ability to show nearby restaurant based on a users current location. In this experiment we will be developing an application that uses location based messaging to show nearby restaurants to a user.

Location based messaging - It is a technique used by mobile applications to provide users with messages or notifications relevant to their current location. This can include information on nearby companies, businesses

events, hospitals, etc. To implement location based messaging, the application must first obtain the user's current location through GPS or other location sensing technologies.

Mapping - It is an essential part of location based services, as it provides a visual representation of the users location and the points of interest around them. Mapping can be achieved through the use of various mapping API's such as google maps, mapbox which provide developers with a range of tools and functionalities for displaying maps and other location related information.

Conclusion: Location based messaging and mapping are powerful tools that can provide users with relevant information based on their current location. By developing an application based on their current location that shows nearby restaurants, we can demonstrate the potential of these technologies and explore some of the challenges involved in their implementation.

Academic Year 2023-24

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Date: 06/02/2025

UBIQUITOUS COMPUTING (UBI)
EXPERIMENT 2

CODE:
Code to fetch location:

```
from geopy.geocoders import Nominatim

def get_device_location():
    try:
        geolocator = Nominatim(user_agent="get_device_location")

        # Using the geolocator to get the location based on IP address
        location = geolocator.geocode('me')

        # Accessing latitude and longitude
        lat, lng = location.latitude, location.longitude

        print(f"Latitude: {lat}, Longitude: {lng}")

    except Exception as e:
        print(f"Error: {e}")

if __name__ == "__main__":
    get_device_location()
```

```
Shree Borivli Gujarati Seva Mandal, A S Vartak Marg, R/C Ward, Zone 4, Mumbai, Mumbai Suburban, Maharashtra, 400092, India
Latitude = 19.2251085

Longitude = 72.8502063
```

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Code to get nearby Malls:

```
from geopy.geocoders import Nominatim
from geopy.distance import geodesic
import requests


def find_nearby_places(lat, lon, place_type, radius):
    geolocator = Nominatim(user_agent="nearby_search")
    location = geolocator.reverse((lat, lon))
    print(f"\nYour current location: {location}\n")

    query = f"{place_type} near {lat}, {lon}"
    try:
        places = geolocator.geocode(query, exactly_one=False, limit=None)
        ans = []
        if places:
            for place in places:
                place_coords = (place.latitude, place.longitude)
                place_distance = geodesic((lat, lon), place_coords).kilometers
                if place_distance <= radius:
                    ans.append(place_coords)
            print(ans)
        else:
            print("No nearby places found for the given type.")
    except:
        print("Error: Unable to fetch nearby places.")

if __name__ == "__main__":
    user_lat, user_lon = 19.2251085, 72.8502063
    if user_lat is not None and user_lon is not None:
        place_type = input("What type of place are you looking for? (e.g., park, mall, ATM, hotel): ")
        search_radius = float(input("Enter the search radius (in kilometers): "))
        ans = find_nearby_places(float(user_lat), float(user_lon), place_type, search_radius)
```

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Code for map:

```
# boulder_coords = [19.0999098, 72.8440038]

ans = [(19.22602565, 72.85462981820581), (19.21332115, 72.84914087727157), (19.2118189, 72.8673877), (19.20290105, 72.8600797318634), (19.1961389, 72.84709037091646), (19.1900395, 72.8591049), (19.18480055, 72.83405222546514), (19.2632484, 72.8743808), (19.17898665, 72.83607339476472), (19.17616575, 72.85827592278093)]
myLoc = [19.2251085 , 72.8502063]
my_map = folium.Map(location = myLoc, zoom_start = 13)

#Add markers to the map
for i in ans:
 folium.Marker(i).add_to(my_map)


#Display the map
my_map
```

OUTPUT:

```
What type of place are you looking for? (e.g., park, mall, ATM, hotel): mall
Enter the search radius (in kilometers): 10

Your current location: Shree Borivli Gujarati Seva Mandal, A S Vartak Marg, R/C Ward, Zone 4, Mumbai, Mumbai Suburban, Maharashtra, 400092, India
```

Academic Year 2023-24

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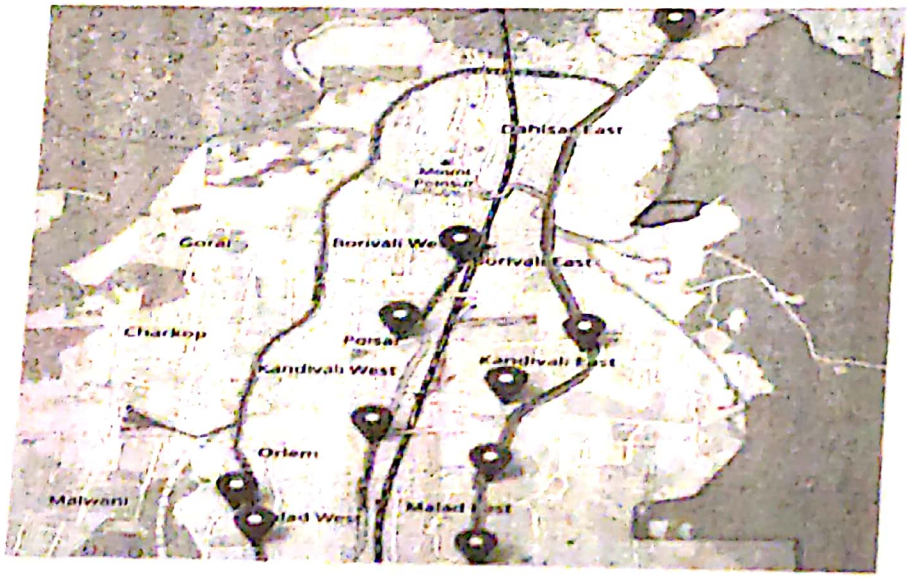

Experiment 3

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Aim: To implement a context aware system.

Theory: Context aware systems are systems that are aware of their situation (or context) in their physical, virtual (ICT) and user environment, and can adapt the system to this in some way, benefiting from knowledge of their situation. For example, in the personal memories scenario, the camera can detect the distance of the camera to the subject of the photo and automatically adapt the focus of a camera lens when recording the image.

The term context aware was first used in 1994 by Schilit and Theimer to refer to a system that can provide context relevant information and services to users and applications. Schilit also defined a context aware system as a systems that adapts itself to the context. There are many other similar definitions.

Models of context aware systems need to define what a range of contexts describe and how context are created, composed and used for adaptation. Context aware system model needs to define how to represent context in a computation form and how to support an operational life cycle in using context aware systems.

* Classification of main types of contexts:

(1) (Physical) Environment context

what → Type of physical environment or physical phenomenon context awareness such as awareness of temperature, light intensity, chemical or biological concentration, etc.

where → Special awareness or location awareness. Eg. The current location in relation to a start or destination location or to a route.

when - Temporal awareness. When context is useful now, later or during some activity.

(2) ICT Environment System Context.

How → ICT awareness! Eg a context or context aware application can be accessed over a wireless link and via a mobile terminal.

(3) User Environment Context:

who - User context awareness, personal preferences, personal identity context, user activity or task context, social context

(4) Goal context

why - Why a context is useful? Eg. location services to show someone or something relevant to their destination.

Conclusion: The concept of context awareness was implemented in a location services where different points of interest were plotted in relevance to users mood.

Code :

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Display a map on a webpage</title>
    <meta name="viewport" content="initial-scale=1, maximum-scale=1, user-scalable=no">
    <link rel="stylesheet" href="https://unpkg.com/leaflet/dist/leaflet.css" />
    <script src="https://unpkg.com/leaflet/dist/leaflet.js"></script>
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.4/jquery.min.js"></script>
    <style>
        body {
            margin: 0;
            padding: 0;
            display: flex;
            flex-direction: column;
            height: 100vh;
        }
        #map {
            flex: 1;
        }
        #content {
            padding: 10px;
            background-color: #f4f4f4;
        }
    </style>
</head>
<body>
    <div id="map"></div>
    <div id="content">
        <p>Displaying location using Latitude and Longitude</p>
        <button class="geeks" onclick="getLocation()">
            Click Me
        </button>
        <p id="demo1"></p>
        <p>Enter your age:</p>
        <input type="number" id="userAge" placeholder="Enter your age">
        <button onclick="getNearbyPlaces()">Find Nearby Places</button>
        <p id="nearbyPlaces"></p>
        <p>Select your gender:</p>
        <select id="userGender">
            <option value="male">Male</option>
            <option value="female">Female</option>
        </select>
```

```
        </div>
        <script>
            var map;
            var userMarker;
            var nearbyMarker;
            let variable1 = document.getElementById("demo1");
            function initMap() {
                map = L.map('map').setView([0, 0], 2);

                L.tileLayer('https://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png', {
                    attribution: '© OpenStreetMap contributors'
                }).addTo(map);
            }
            function getLocation() {
                if (navigator.geolocation) {
                    navigator.geolocation.getCurrentPosition(showPosition);
                } else {
                    console.error("Geolocation is not supported by this browser.");
                }
            }
            function showPosition(position) {
                var lat = position.coords.latitude;
                var lon = position.coords.longitude;
                variable1.innerHTML =
                    "Latitude: " +
                    lat +
                    "<br>Longitude: " +
                    lon;
                console.log(lat, lon);
                displayMap(lon, lat);
                console.log(lat, lon);
            }
            function displayMap(lon, lat) {
                if (!map) {
                    initMap();
                }
                map.setView([lat, lon], 15);

                if (userMarker) {
                    userMarker.setLatLng([lat, lon]);
                } else {
                    userMarker = L.marker([lat, lon]).addTo(map)
                        .bindPopup('You are here!')
                        .openPopup();
                }
```

```
        }

        function getMarkerIcon(color) {
            return L.icon({
                iconUrl: 'https://www.svgrepo.com/show/376955/map-marker.svg',
                iconSize: [30, 41],
                iconAnchor: [12, 41],
                popupAnchor: [1, -34],
                shadowSize: [41, 41],
            });
        }

        function displayMarker(lon, lat, place) {
            if (nearbyMarker) {
                nearbyMarker.setLatLng([lat, lon]);
            } else {
                nearbyMarker = L.marker([lat, lon], { icon: getMarkerIcon('#ff0000') }).addTo(map)
                    .bindPopup(place)
                    .openPopup();
            }
        }

        function calculateDistance(lat1, lon1, lat2, lon2) {
            const R = 6371;
            const dLat = (lat2 - lat1) * (Math.PI / 180);
            const dLon = (lon2 - lon1) * (Math.PI / 180);
            const a =
                Math.sin(dLat / 2) * Math.sin(dLat / 2) +
                Math.cos(lat1 * (Math.PI / 180)) * Math.cos(lat2 * (Math.PI / 180)) *
                Math.sin(dLon / 2) * Math.sin(dLon / 2);
            const c = 2 * Math.atan2(Math.sqrt(a), Math.sqrt(1 - a));
            const distance = R * c;
            return distance.toFixed(2);
        }

        function getNearbyPlaces() {
            let variable1 = document.getElementById("demo1");
            let nearbyPlacesDisplay = document.getElementById("nearbyPlaces");
            let moodSelector = 'library';
            let userLat = variable1.innerHTML.split("<br>")[0].split(":")[1].trim();
            let userLon = variable1.innerHTML.split("<br>")[1].split(":")[1].trim();
            let userAge = document.getElementById("userAge").value;
            let userGender = document.getElementById("userGender").value;
            let ageBasedLocations = {
                'child': {
                    'male': {
                        'library': [
                            { lat: 19.100, lon: 72.850, name: 'Child Male Library 1', address: 'Child Male Library Address 1' },
                            { lat: 19.110, lon: 72.860, name: 'Child Male Library 2', address: 'Child Male Library Address 2' }
```

Shashwat Shah
1/22026

Output :

Initial screen :

After providing age :

Experiment 4

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Aim: To design an interface in order to study human computer interaction.

Theory: Human computer interaction focus on the design, evaluation and implementation of computer systems & interfaces that are intuitive, efficient and enjoyable for human users. It combines principles from computer vision, psychology & design to create user-centered system that take into account the needs, ability & preferences of the user. It is an iterative design process that incorporates the needs, abilities & preferences of the user. It is an iterative design process that incorporates user feedback & usability testing to ensure that final product is functional & easy to use.

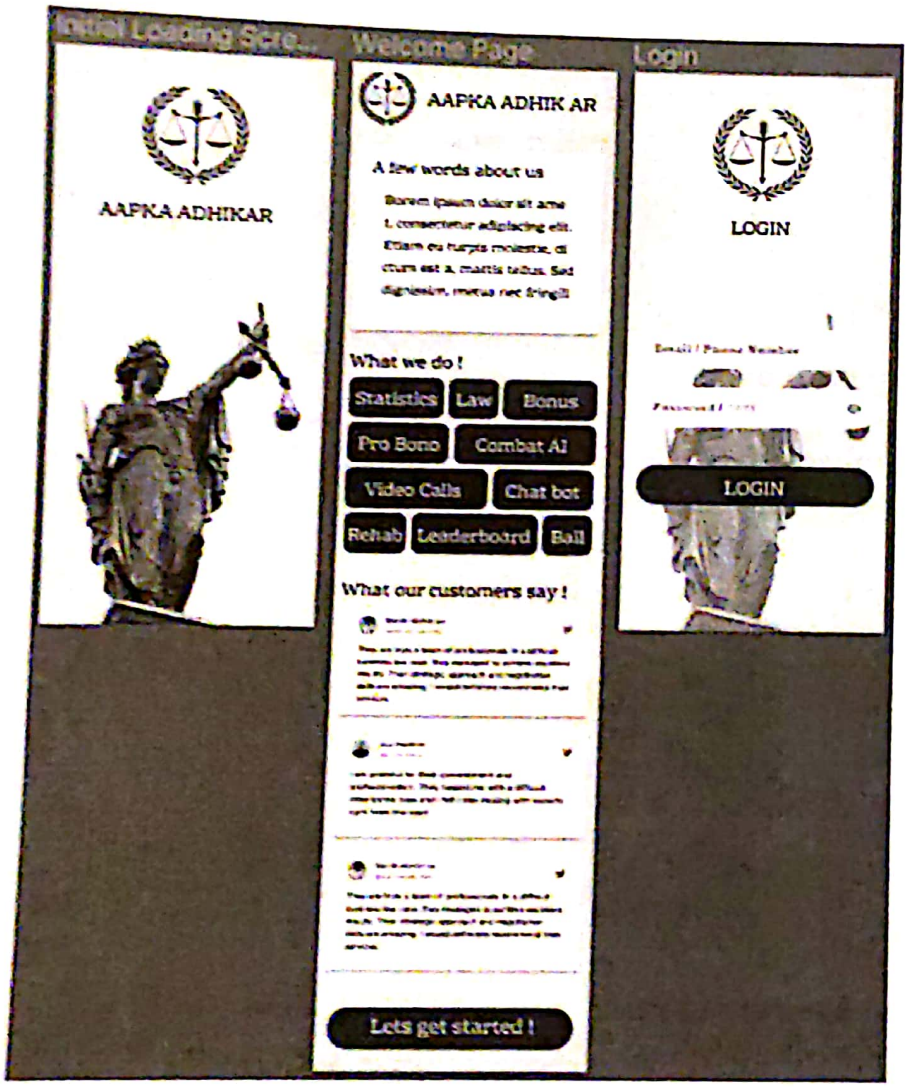
HCI includes.

1) Interface design -
User experience design - they can both effective & easy to use
Accessibility - It involves designing systems that can be used by individuals with a wide range of abilities and disabilities
Usability testing - A website for displaying results of past dates we implement a responsive design using tool figma. It has the following features.
Authentication - We have a login/signup page
Adding robots to the system.
Listing the devices available.
Identifying the past detected through maps
It generates number of posts found and classifies them

Experiment 4

Figma link : https://www.figma.com/file/7TTV79jgJJTcbptJ9b0DBo/SIH---Lawyer?type=design&mode=design&t=wEK6la16BwACajFG-0

Images :



Experiment 5

12/15

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Aim: To implement Ubiquitous Computing.

Theory: Ubiquitous applications use communication network to use relevant remote external information & tasks, anywhere & anytime. Although, communication access can be modelled as part of the internal system the core of the communication network infrastructure is considered to be external to the system & part of the systems computing environment. This concept is part of the broader idea of ubiquitous computing where technology becomes unusable & prevasive in everyday life.

Some of the key aspects include

→ Cross platform compatibility - Users can communicate across different devices & operating systems such as tablets, smartphones, etc.

→ Multiple connection channels - Ubiquitous communication support various forms of communication including text messaging, voice calls, video & email.

→ Seamless Integration - Communication is integrated across various application & servers, allowing users to switch between different communication method & devices effortlessly.

Many general & introductory tasks & descriptions

about networking are oriented towards specific type of network telecoms focus on voice communication & its use as wireless network for data & audio video over telecom ubiquitous communications prototypes high quality and reliable communication experiences, regardless of user's location & network conditions. Ensuring server communication & protecting over prevailing is crucial in ubiquitous communication.

Conclusion - Ubiquitous communication was studied and implemented with the help of file sharing & text chatting system between multiple users in a same network.

Experiment 6

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TY Btech Comps B

13/15

Aim: Case study of class 2030 based on ubiquitous computing perspective.

Theory: Class 2030 refers to the generations who will be studying in classroom with computer accessories. It will be a classroom modern era where teaching will be assisted with advanced technology, artificial intelligence and seamless digital integration. This generation with class 2030 will grow up in the world very different from now. The ubiquitous computing holds potential to transform way classroom looks today.

With class 2030 the classrooms will have:

) Smart learning environment - Implement a smart class with AI powered personalised learning experience, monitor students engagement and adapt content based on learning styles.

) VR/AR experience: Implement VR/AR applications for education so that students can understand the concepts visually and grasp knowledge fast.

Collaborative work environment - Introduce collaborative task and platforms and cloud based tools for group project, measure the efficiency and creativity of class 2030 in virtual workspace.

Intelligent Automation - leads to greater automation of every day task, driven by intelligent algo and AI. Attendance systems that will automatically mark students attendance by, social recognition, reducing administrative burden.

(5) Enhanced user interface: Future interface will move beyond screen and keyboard to include voice, gestures and content based interactions. VR will allow students to explore sites, into which cant be done in normal class like seeing historic sites and science experiments.

This will impact on education by:

(1) Education advancement by suggesting smart learning environments that cater diverse learning style.

(2) VR/AR will impact on increasing acceptance may signal a shift towards immersive learning and environment exp.

(3) With collaborative smart tools they will get an understanding on how to work in team like creating project which makes environment on smart device like for communication using online meeting software.

(4) Automation on attendance system and giving analysis of each by behaviourly tracking will help teacher to monitor each and every student and can guid them accordingly.

Conclusion: Class 2030 using ubiquitous computing reveals promising insights into their seamless integration with advanced technologies. This suggests potential advancements technology education and redefine various aspects of modern life.

Experiment 7

14/15

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TYBtech Comps B

Aim: To implement ubiquitous computing. case study (Supermarket)

Theory : The goal of ubiquitous computing in supermarket was to create a more seamless and convenient shopping experience for customers, while also improving efficiency and reducing cost for the store.

So traditionally a variety of technologies were used to enhance the shopping experience for customers.

1) RFID - Radio frequency identification tags were attached with the products to track their movement throughout the store. This allowed for real-time inventory management, and enabled store associates to quickly locate products that were out of stock or misplaced.

2) Electronic shelf labels were used to display pricing information and product details. These labels could be updated in real time to reflect changes in price or promotions, and they eliminated the need for manual price tags.

3) Mobile devices were used by store associates to assist customers with product information and to manage inventory. They could also use these devices to scan products and process management, which reduced the need for customers to stand in long checkout lines.

4) Bluetooth beacons were placed throughout the store to transmit location specific messages to customers smart phone. This allowed the store to send personalized promotion or product recommendations based on customers location within the store.

3) Ethical considerations - As retailers collect more data about their customers, there are ethical considerations around how this data is being used.

4) Technical Expertise - Implementing and maintaining the technologies require high level of technical expertise.

Now the model to solve the currently existing issues :

1) Retailers can implement advanced data analytics tools and techniques.

2) They can invest in upgrades to their infrastructure, such as expanding network bandwidth.

3) Adopt Ethical frameworks such as IEEE global initiative for ethical considerations.

4) Retailers can work with technology vendors and system integrators who have the necessary technical expertise.

Conclusion : Thus, we have performed case study on ubiquitous computing in Supermarket.

Experiment 8

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TYbtech Comps B

Aim : Case study 'Hospital Management'

Theory : The goal of ubiquitous computing in hospital management was to create a connected and efficient healthcare system that provided quality care to patients while reducing costs and improving efficiency.

So traditionally various technologies were used to automate and streamline hospital operations.

1) Electronic health records (ECR) were used to store patient information digitally. This allowed for quick and easy access to patients record by healthcare professionals, reducing the need for paper based records.
2) Automated patients monitoring systems - remote monitoring and alert healthcare professionals.
3) RFID tags - mainly to track and manage medical equipments supplies and inventory.
4) Wireless communication - like wifi and bluetooth were used to connect different devices and systems in hospital
5) Smart Rooms - designed with sensors and automation technology to adjust the temperature, lighting and other environmental factors.

some of the previous challenges include :

1) Data Quality - The accuracy and completeness of data in electronic health records and other digital systems

Some of the solutions to solve the currently existing issues are :-

1) Implement robust cybersecurity measures, including access control encryption and firewall.
2) Establish a data governance framework that includes policies and procedures for data management, sharing and analysis.
3) Develope a compliance program that ensures the HIPAA and GDPR are compiled with.
4) Develop ethical guidlines for the use of Ubiquitous computing in healthcare. Encourage ethical discussions and debates among healthcare professionals.

Conclusion : Thus, we have performed case study on the Ubiquitous Computing in hospital management.

Experiment 9

14/15

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Aim: Case study on evolution of smart Devices

Theory: Smart devices have evolved significantly over the years from the simple mobile of the past to the sophisticated smartphone, tablet, smartwatches, and smart homes of today. This evolution has been driven by advances in technology user demands, and the need for more connected and efficient devices.

Traditionally, devices were designed to perform specific functions such as making calls, sending messages, or browsing the internet. These devices were typically standalone, and users had to manually input data and interact with them physically

Some of the previous challenges include
Limited functionality - Traditional devices had limited functionality and could only perform specific tasks, which restricted their usefulness.
Limited connectivity - These devices were not connected to the internet, which meant that users could not access online services or share data with others easily.
Poor user experience - The user experience of traditional devices was often poor, with slow response time and limited options.

These were solved

→ Increased functionality - Smart devices are designed to perform multiple functions, including communications, entertainment, productivity and health tracking.

→ Connectivity - Smart devices are connected to the internet, allowing users to access online services and share data with others seamlessly.

→ Enhance User Experience - Smart devices are connected to the internet, allowing users to access online services and share data with others seamlessly.

What challenges still existing.

→ Privacy concerns.

→ Interoperability.

→ Power consumption

Solutions -

→ Manufacture should implement robust privacy protection measures, such as data encryption and user permission controls to safegaurd user controls.

→ Standardization of communication protocols and API's will help ensure interoperability.

→ Low power modes, efficient processors and wireless charging can be adopted.

Conclusion : Thus, we have performed case study on evolution of smart devices.

Assignment 1

8/10

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1 List Ubiquitous computing properties

→ Ubiquitous system are suitable in human centere personalized environments interacting less about results with human

→ Ubicomps systems are part of and used in physical env serving more of the physical environments

Computers need to be networked, distributed and transparently accesibles

→ human computer interaction needs to be hidden more

→ Computers need to be context aware in order to optimize their operation in their env. It is proposed that there are two additional core types of requirements.

For Ubicom system.

→ Computers can operate autonomously, without to pure human computer interaction.

→ Computers can operated on a multiplicity of dynamic action and governed by intelligent decision making & intelligent organisation interaction. This may entail some form of artificial intelligent in order to handle -

a) Incomplete & non deterministic interactions.

b) Cooperation & competition between member organizations

c) Richer interaction through sharing of context semantics & goals.

2) Compare the strengths & limitations of contact v.s Contactless smart card devices.

→ NLI can be especially used & slow when a series of commands need to entered.
Natural language commands can be given in three terms
If can be typed, it can hand written and it can be spoken

4) List the challenges in Ubicom.
→ Challenges in design support for Ubi com system are as follows.
Distributed
Reliability can decrease as system became money upgradable and interoperability.
Openness increases incompatibilities, free leaders resource use, reduces responsiveness
Less clearly defined system boundary.
Incl:
Users get overload by interaction possibilities as the digital landscape expands.
System takes away control from the user. Ambiguous User intentions lead to incorrect system interpretations
Context, aware
No omnipresence - Sense - act through keyna at the env. that set as filters.
Uneven or patchy sensed env events & context
Autonomous.
Loss at high value means mobile resources. No one wants to an administrator. Administration is more distributed, complex.
Intelligent.
System into state, knowing context, etc incorrectly

Assignment 2

6/10

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Paper Name - Computational enhancements of wearables healthcare devices on pervasive computing system.

Journal name - Journal of ubiquitous computing & communication technologies.

Year of publication : 2020

Summary : The paper introduces a sophisticated dispersed & elastic computing model (DECM) aimed at addressing the multifaceted challenges inherent in managing resources Eg communication within the context of pervasive computing systems environment (PCSE) with a specific focus on IOT based wearable healthcare devices. DECM leverages cutting edge reinforcement learning algorithms to dynamically allocated resources, thereby minimizing delays & maximizing communication efficiency. Noteworthy features include the ability to intelligently balancing the flow of requests throughout the network and optimize storage utilization both of which are critical for seamless operation in diverse & demanding environments.

One of the key highlights of the proposed DECM lies in its ability to enhance convergence robustness thereby significantly improving the overall performance.

of Ubiquitous systems for IOT - based wearable healthcare devices. By employing recurrent learning algorithms, DECM effectively computes & optimizes resource allocation, mitigating bottlenecks in request conveyance & enhancing the flow of data. Moreover, the optimized storage allocation facilitates the efficient handling of requests with varying densities, further contributing to the smooth operation of system.

The paper substance the effective of DCEM through an extensive experimental analysis, comparing its performance against existing methods. The results underscore DCEMs superiority in terms of request handling capacity, response time, & resource utilization efficiency.