Home Automation with Machine Learning and Human-Computer Interaction

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Abstract

By combining three technologies all together, Machine Learning (ML), Human-Computer Interaction (HCI) and Augmented Reality (AR). I have developed "smart" home automation application. This iOS Application is developed in Xcode IDE by using Swift programming language, MVC pattern, ARKit framework, CoreML and Vision APIs. Gesture Recognition, Sound Recognition are the main way of interaction, with touch and sound as an integral interactive model of interaction.

Machine Learning

ML a sub branch of Artificial Intelligence (AI), reform mobile applications to be more efficient and accurate by predicting outcomes with authentic data as input. Accessing Core ML (ML API) with Swift, the API integrates machine learning models in your iOS application. With use of API and user data, it predicts and fine-tune outcomes / models. Merging AR with Computer Vision, ML and Computer Graphics, provides application to analyse images, Natural Language for processing text, Speech for converting audio to text, and Sound analysis for identifying sounds in audio.

Human-Computer Interaction

HCI is a sophisticated interaction between the user, the computer, and the way they both work together. HCI is an interdisciplinary area concerned with the design, assessment, and evaluation of Interactive Computer Systems. In order to build effective interaction. The Goals of HCI are:

- Provide Functional, Usable and Safe Computer Systems
- Achieve efficient, effective and safe interaction
- Understand the factors that determines how people interact and use technology

Norman's Interaction Theory diagram of the Human-Computer Interface interaction, proposes that a user first establishes a goal and then performs actions using the system to achieve that goal. A system reflects the output of these actions on the interface. A user observes the interface and evaluates if their goal has been met. If not, a new goal is established, and the cycle is repeated. This model of interaction explained is divided into seven primary stages:

- Establish the goal
- Formulate the intention
- Specify actions
- Execute actions
- Perceive system states
- Interpret system states
- Evaluate system states

Introduction

The Home Automation application combines ML, HCI and AR. With help of a camera and Lidar sensors it scans and analyzes image on the wall with 90% accuracy and overlay a plane node on it, with Speech Recognition and SiriKit application understands audio command "show Instagram profile" and it displays the "Instagram profile" on plane node by accessing Internet. This application can help users to access their social media profile in three dimensional space, with Gesture Recognition, the application detects the touch on plane node and user can scroll and navigate their profile in 3D environment with ease.

Keywords

Augmented Reality, Real World Environment
Augmented Reality Wearables, Smart Glasses,
Human-Computer Interaction, Spatial Computing, Perceptual Experience, CoreML,
ARKit, Artificial Intelligence, Machine Learning, Computer Vision and Graphics, Natural Language, Siri, Voice Commands

Methodology

- Human-Computer Interaction
- Augmented Reality and Machine Learning
- Understanding Swift, ARKit, CoreML, Computer Vision, and Graphics concepts
- Developing application in Xcode
- Evaluation, Deployment, and Validation of application

## Insights to Home Automation with ML, HCI, and AR

As it can be seen from the images, the overlay node is placed by scanning images with Core ML, and social media is displayed in AR, which is of great benefit. Users can scroll social media profiles by scrolling on a plane node with gestures. This interaction of humans and computers in real-time in AR is the future scope of automation and accessing 3D social media in a real-world environment.

(Developed by: 'Author' Atharva Kulkarni, for iOS platform: Application video preview)

AR & ML, VR market Worth in $bn
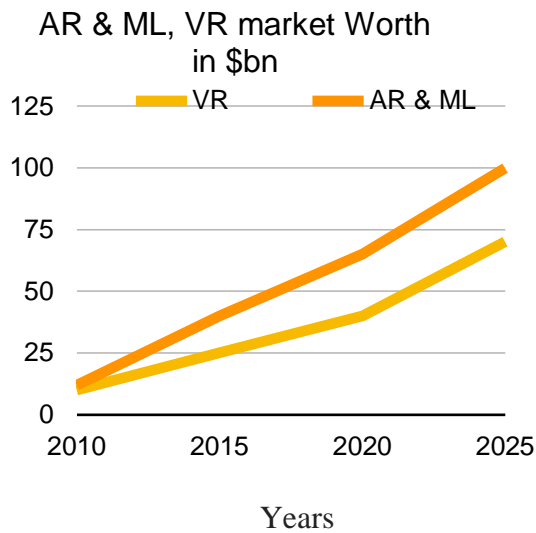
Future Scope

Although often overshadowed by virtual reality (VR), AR and ML is expected to take the lion's share of the market. According to one estimate, the AR and ML market will be worth between $70b and $75b by 2023, while VR is expected to be worth between $10b and $15b.

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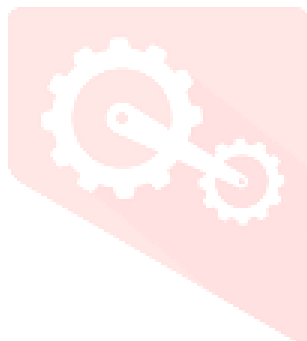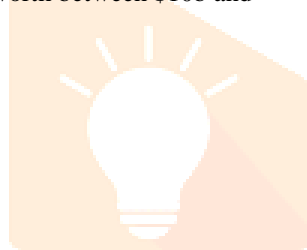
Conclusion

The rise of ML and AR will create the next generation of the internet, a 3D spatial medium in which will physically live, work, and interact by wearing AR wearables and smart glasses. As this occurs, HCI will permanently change

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