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Evaluating the User in a Sound Localisation Task in a Virtual Reality Application

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INTRODUCTION

Virtual reality technology is fast becoming the accepted platform for delivering high-quality immersive audio-visual experiences [1]. It has the potential to enable truly personalized experiences due to its adaptability and flexibility. Although a lot of the discussion on VR has focused on the visual aspect of the experience, but audio also plays a crucial role in terms of user immersion [2]. With the advancement of audio technologies, it is possible to render and apply audio with a high level of quality, meaning human sensation to discriminate sound in terms of depth, elevation, and localization [3]. Specialized audio is very important in industries like gaming and for communication tasks, and in environments that require humans to accurately give attention to a specific sound in space [4][5]. In this paper, an immersive VR spatial audio application is presented. It enables us to evaluate the ability of users to specify and localize the source of a sound. An integrated sensing system continuously collects relevant data from the user in order to help understand how to capture and evaluate spatial auditory skills from a qualitative perspective. This gives us insight into a user's spatial and behavioral orientation. To perform a detailed CUE evaluation of the testing task, results and explicit metrics are collected from the user. CUE collected from this CUE evaluation gives us an insight into a user's ability to localize sound sources in VR, and also provides information on behavior and effort (motivation) in performing the task.

EXPERIMENTAL METHODOLOGY

The virtual environment was designed using a Unity game engine (version 2018.2.21f1) with a Steam Audio and virtual mixed reality (VR). The immersive VR head was the HTC Vive with the Oculus Rift S. One of the experiment stimuli was to evaluate user interaction with the system. This involved capturing a head movement and a 3D space. The sounds and spatial localisation task consisted of these testing phases (Fig. 1), required by the test:

1. Target only.
2. Target + detector (same location).
3. Target + detector (off-grid with a small distance). The user was required to select the correct sound source with a total of 72 trials (6 trials for each testing phase). The experimenter used a software tool designed to guarantee that each sound will be reproduced at least 3 times in total, one for each testing phase.

RESULTS

The results from Table 1 represent the average raw scores for each group across the testing phases. This table shows that both of the groups had localization errors (angle error < 4°). Additionally, these values indicate that participants localized the target by one (4°) or two solutions (18°). The results from the table also indicate that front-back confusions were not frequent across the task, with the majority of localization errors classified as localization error.

Table 1: Average raw scores for each group across testing phases

<table>
<thead>
<tr>
<th>Testing Phase</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target only</td>
<td>50 ± 3°</td>
<td>50 ± 3°</td>
<td>50 ± 3°</td>
</tr>
<tr>
<td>Target + detector (same location)</td>
<td>50 ± 3°</td>
<td>50 ± 3°</td>
<td>50 ± 3°</td>
</tr>
<tr>
<td>Target + detector (off-grid with a small distance)</td>
<td>50 ± 3°</td>
<td>50 ± 3°</td>
<td>50 ± 3°</td>
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</tbody>
</table>

The time-to-completion results for the test were included in order to give insight into the scoring curve for the localization task. An interesting result is related to the need to increase the completion time mean values across the three conditions. Since the complexity is increasing across the phases, it was expected that the time to complete each phase would increase. However, this is the first time that an indication of the completion time has been recorded.

CONCLUSION

The use of 3D audio in VR applications produces a realistic and more accurate representation of the surrounding by attenuating the level of real-life sound and ambient. Furthermore, the use of combined visual and auditory stimuli helps the user to localize a sound source.

From the CUE perspective, the application can be more detailed and focused towards the sound localization task, and its contributions can be supplied within the self-context, adding relevant data to the existing assessment and integration methodologies for auditory disorders.

ACKNOWLEDGMENTS

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REFERENCES


Two figures of a diagram and an arrow with a label: What are the benefits?
Smart Contract Driven Resource Management for Edge Computing

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ABSTRACT
Edge computing has witnessed a rapid growth in the past few years as mobile and Internet of Things (IoT) devices are getting connected to the Internet. The Internet is not gaining any benefits from the current implementation of ad hoc and infrequent edge resources. Transparency and trust need to be introduced while distributing the resources equally to both the edge resource provider and edge resource consumer.

By completely decentralized the edge resource management, these resources can be made available to the public in the form of ad hoc and frequent edge computing. This paper proposes a smart contract-driven resource management for Edge Computing.

INTRODUCTION
Edge computing provides cloud resources with adequate network connectivity close to the device regardless of the location. Edge computing is rapidly evolving to capture the latency and bandwidth in accessing cloud resources as billions of computing devices are connected to the Internet. The current research is primarily focusing on developing cloud resources from a centralized cloud resource provider to the Edge of network and redressing them for improving application performance. But these Edge resources are configured in an ad-hoc manner and an application or a collection of applications may use them. These Edge resources are not public and not in synchronization with the geographically distributed resources.

However, as devices and intelligent Edge resources are used, it is useful to transform the global Internet. The benefits of the Edge computing are significant in terms of reducing the cloud resource costs, increasing the performance of the Edge resources, and improving the security of the Edge resource. Edge computing resources are primary, which is related to trust, especially when it is implemented in a distributed and decentralized manner. Edge resource governance is difficult when it is not known, who is using and managing the Edge computing devices and when to trust when using Edge computing services.

The above mentioned trust-related challenge can be solved by using blockchain as it is a Distributed Ledger Technology (DLT). Blockchain can track and record any transaction between any two entities in a transparent manner in an immutable history record. Therefore, it is a suitable approach for Edge computing. A blockchain-based Edge computing framework can be designed to ensure transparency, reliability, and security.

Our research aims to develop a smart contract-driven resource management (SCDRM) mechanism that allows edge resource consumer to establish resource sharing context with resilient cloud resource consumer, including the following research objectives.

- How to create a platform that simulates resource consumer to establish a shared service context using blockchain smart contract to ensure the quality of service for consumer applications?

- How to reconcile the benefits of resource providers with the benefits of resource consumers?

To resolve these challenges, the research seeks to develop a smart contract-driven resource management framework. This framework will be used to establish and maintain resource sharing contexts between edge resource consumer and edge resource provider.

METHODOLOGY

Blockchain is the key technology behind the resource management. Blockchain technology is used to establish a shared service context using blockchain smart contract. The benefits of blockchain can be used to implement the resource sharing context. Blockchain technology is used to establish a shared service context using blockchain smart contract. The benefits of blockchain can be used to implement the resource sharing context.

The Edge Computing framework is designed to use blockchain technology to establish a shared service context using blockchain smart contract. The benefits of blockchain can be used to implement the resource sharing context.

CONCLUSION

Edge computing is gaining momentum due to the demands of the resource sharing context and Edge resources. The benefits of blockchain can be used to implement the resource sharing context. Blockchain technology is used to establish a shared service context using blockchain smart contract. The benefits of blockchain can be used to implement the resource sharing context.
A QoE and Visual Attention Evaluation on the Influence of Spatial Audio in 360° videos

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RESEARCH QUESTION
What is the impact of different types of audio (stereo & spatial) on user QoE (Quality of Experience) and Visual Attention in 360° video environments?

DOES SPATIAL AUDIO MATTER IN 360° VIDEOS?
Adding spatial audio may completely change the way users watch the 360° videos. How they move their heads affects their focus and what content they can remember after each exposure.

RESEARCH Aims
This research aims to investigate what we can use multimodal dataset (e.g., gaze, head-gaze, head-rod, physiological) activity captured from users as they consume immersive content, to predict their QoE (Quality of Experience) and Visual Attention in 360° videos.

RESEARCH RISKS
- The research community needs to develop: (a) metrics for assessing the impact of spatialized audio on immersive experience. (b) Evaluation framework that can help us understand new paradigms in terms of interaction and presence.

METHODOLOGY
BASERED ON ITU-7 RECOMMENDATION P.913, DESIGNED BETWEEN SUBJECTS

Phase: Duration | Activity | Tools
--- | --- | ---
Preparation | 10 min | Explain test details to subject | Information Sheet, Consent Form
Screening | 10 min | Assess visual acuity and color perception | Snellen Chart, Ishihara color blindness test
Training | 5 min | Get subject to be familiar with the VR environment | Training video
Testing | 15 min | Subjects view two 360° videos of 5 min each in one of the four audio conditions: 360° video with non-spatial/spatial audio. No Sound, Stereo, Ambisonics, Third Order
Questions | 10 min | Subject answers questionnaire | Subjective Questionnaire

TESTED
Component | Manufacturer | Used For
--- | --- | ---
HMD | HTC Vive with Tilt Pro VR integration | Worldly 360° videos
Sound | 360° headphone | Listening to non-spatial/spatial audio
VR player | GoPro VR Player | Checking head-orientation on Vive, Pitch and Roll
Sensor | Emotiv EPOC+ | Recording EDA and Heartbeat
SDK | Tilt Pro Python SDK | Obtaining Gaze data, Direction and Papillar Data

Preliminary Findings
- First, under the 3D and the 3D360 conditions, participants had an increase in attention and localization, as well as in terms of attention requirements and enjoyment of the experience.
Anomaly Detection in Cyber Security

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Research Question?

- Identify anomalous (outliers) system call sequences in security domain (Host based Intrusion Detection System)

Anomaly Detection System

Locate Links

Sorting

Detect Intrusion

Classify

Report Alert

Anomaly Detection

Validate Issue

Anomaly Detection System

Investigate Incident Network

Trunk Normal

System

Network

ECML PKDD 2018 Workshops

Read first chapter

Prezi
Enabling Human-Robot-Interaction via Augmented and Mixed Reality System

Introduction

- Human-Robot Interaction (HRI) will be a key component towards smart factories of the future.
- HRI must strictly adhere to the industrial standard safety requirements by taking into consideration the system communications with the user ensuring safety (distance between the operator and the robot).
- User training and instructions cannot be exchanged by a Human-Computer interface (HCI).
- The task must be performed autonomously (threshold requirement for the HRI to ensure and user satisfaction).
- Function impacting user safety include Control, Human-Operator and System.

Use Case

- The research concentrates on path planning stage of industrial robots, where AI technologies can be utilized by operators with limited background knowledge in robotics programming.
- We present and analyse different path planning scenarios.
- The power of our proposed system is illustrated.

Research Problem and Methodology

- We will evaluate our system using the standard QTool evaluation metrics.
- The system will then be applied to various tasks.
- We will evaluate the system using the International Society of Robotists’ Regulations and Standards.

System Architecture Diagram

The aim of this research is to design and evaluate a system based on QTool principles, a novel HSI tool incorporating Augmented Reality (AR).

Discussion

- We believe the design of robotic paths can reduce human operator’s workload.
- We intend to evaluate the system in different environments and tasks.
- We will evaluate the system using the International Society of Robotists’ Regulations and Standards.
A QUALITY OF EXPERIENCE EVALUATION OF COLLABORATIVE DESIGN TASKS IN VIRTUAL REALITY

INTRODUCTION

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Department of Electronics & Information

Faculty of Engineering

The research is an initial step towards understanding the quality of experience in collaborative design tasks in virtual reality (VR) environments. The study aims to evaluate the subjective experience of participants when performing design tasks in a VR setting.

METHODOLOGY

The study employs a user-centered approach, involving a mixed-methods design. Participants are divided into groups and are asked to perform design tasks in a VR environment. The tasks involve spatial manipulation and collaboration.

PROGRESS & REAL-WORLD IMPLEMENTATION

The framework includes the following components:

- **Participant Interface**: This component allows participants to view and manipulate objects in the virtual environment.
- **Collaboration Tools**: These tools enable real-time collaboration between participants.
- **Evaluation Module**: This module collects and analyzes data to evaluate the quality of experience.

The framework has been implemented in a VR environment, and preliminary results indicate improvements in the quality of experience compared to traditional design methods.


RESEARCH QUESTIONS & OBJECTIVES

The research questions and objectives are as follows:

**Research Questions**

- What is the impact of VR on the quality of experience in collaborative design tasks?
- How does spatial awareness affect the efficiency of collaborative design?

**Objectives**

- To evaluate the subjective experience in collaborative design tasks in VR environments.
- To investigate the effects of spatial awareness on task performance.

The research aims to provide insights into the design of collaborative VR environments and contribute to the development of more effective tools for collaborative design.
A Quality of Experience and Cybersickness Study of an Immersive Wheelchair Training Application

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Uberlandia, Brazil

Wheelchair Simulator: Assistive Technology & Immersive Virtual Reality

- It is an immersive training tool for new wheelchair users

Fig. 1: Current training course included in the Wheelchair Simulator

Objectives

- Implement the simulator for testing:
  - Testing with normal population (24 people)
  - Testing with high risk population (24 people)
  - Testing with high risk population (20 people)

- Assess the simulator's effectiveness in teaching wheelchair users
- Assess the simulator's effectiveness in improving the user's quality of life
- Assess the simulator's effectiveness in reducing the user's risk of accidents

Assessment Protocol

- Information
- Consent Form
- Demographic Test
- simulator Test
- Pre-test measurements
- Training
- Free practice
- Testing
- Post-experience questionnaires

Results

- Group that experienced the simulator with high risk population: less positive result from simulator orientation
- Group that experienced the simulator with normal population: more positive result from simulator orientation

- The simulator with a high risk population (20 people)
- The simulator with a normal population (24 people)

- Results with a high risk population (20 people)
- Results with a normal population (24 people)

- The simulator with a high risk population (20 people)
- The simulator with a normal population (24 people)

Quality of Experience (QoE) measurements

- QoE studies attempted to understand the influence of various factors on the quality of experience different participants' application

Subjective measures

- Presence (EQM) and usability (EQUS) questions
- SAQ assessment (Stressful assessment)
- NASS-10 questionnaire (Kognitive Task load assessment)
- Simulator sickness questionnaire (SSQ)

Objective measures

- Capturing physiological data during the test
- Performance report

To Date Publications

Introduction
Over the past few years the rise in big data has generated a lot of traction and attention. The sheer volume of data produced by humans is increasing rapidly each year.

The growth in social media over the past few years has changed how we interact and how we connect globally, as such there is a need to ascertain user sentiment. Sentiment Analysis (SA) is a branch of computational linguistics and natural language processing that studies how to computationally derive the sentiment implied by a piece of text. It is an ongoing field of research.

Natural Language Processing (NLP) is used to design or identify meaning to written or spoken language or to use in further analysis with machine learning.

Keywords: Sentiment Analysis, Natural language processing, social media, Classification, Big Data

Experimental Setup
Dataset: The dataset used was a mix of headlines and body texts from a selection of the most popular newspapers around the world as well as social media data and reviews on a choice of websites.

Pre-processing: To clean the data, a few processes such as tokenization, stop word removal, regular expression matching to remove certain symbols such as HTML, A list of words dictionary to convert contractions back to their original word meanings like couldn’t too could not. The data was then cleaned from punctuation to lower case and numbers were removed.

Analysis: As the data stands it can be difficult for the classifiers to decide what the polarity of the data might be, whether it be negative, positive or neutral. In order to ascertain the polarity there were two different open source tools used: VADER (Valence Aware Dictionary and sentiment Reasoner) which is a python library used to find the sentiment expressed in social media primarily 

Classification: When deciding to choose the best classifier for sentiment analysis in supervised learning it was important to look at what classifiers were most suited to the type of data being processed. From previous work logistic regression, random forest and naive bayes seemed to be among the most widely used classifiers.

Results

Fig. 8: Comparison of results classification from VADER and NAIVE

The data collected and processed was run through two open source tools mentioned in the experiment set up. As seen in Figure 3 VADER classified the majority of data as neutral in polarity while Stanford classified it as negative. VADER is more generic than Stanford for categorizing sentiment.

Conclusion
The results above showed the difference in how the two algorithms classified the different data with a shared tendency towards one category in the three point Likert scale. The Stanford data produced a higher accuracy than that of the VADER.

Due to the negative nature of data one would have to delve deeper into the data and start looking at the level of negativity perhaps in a five or seven point Likert scale. This would provide the intensity of the negativity within a tweet or headline.
A QoE Evaluation of an Immersive Autonomous Virtual Reality Driving Experience

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INTRODUCTION

At the early stages of adoption, Autonomous Vehicles (AVs) with high automation (SAE level 4 and 5) will share the streets with other road users (i.e., pedestrians, human-driven vehicles, cyclists, etc.) and depend on current infrastructure with its irregularities (i.e. unmarked roads). These challenges demand testing AVs in computational simulated environments and investigating how users interact with these systems.

The immersion delivered by simulations may influence the user's perceived QoE [2]. In this context, the work promotes a VR autonomous driving experience in a street in Athlone, Ireland, using two different formats: firstly, photogrammetry to provide realistic 3D content and secondly, a non-photorealistic environment. This system was built to investigate the impact of graphics quality on immersion levels and perceived QoE.

AIMS AND OBJECTIVES

- Understand the relationship between graphics quality and immersion levels in AV-based simulations from a QoE perspective.
- Compare the users' perceived QoE of AV technologies under different levels of immersion.
- Test AV User Interfaces (UI) and feedback modalities to determine the scenario that delivers the highest QoE.

METHODOLOGY

Photogrammetry is a method that uses photos taken from different angles to computationally define the sense of depth of the captured scene. In the first method, videos from the real environment were collected to create the photorealistic environment using Autodesk ReCap Photo [3]. For comparison, the environment was also built using traditional meshes, modeled in Blender [4] which can be defined as a low-polygon-based method. The quality produced by the low-polygon-based approach can be observed in other studies [5, 6] in which textures were applied over flat surfaces, such as plains or boxes, with no depth effect on building structures and low texture quality. The final product is an environment that looks more like a game.

The simulation for both methods runs on the HTC Vive Pro Eye [7] with eye tracking capabilities used to study a user's attention and focus during the simulation.

CONCLUSION

This demonstration endeavours to create a task that fulfills the needs for assessing AV technology in VR. Objective and implicit metrics are addressed to understand what promotes the highest level of immersion when using a HMD. The possibility of rendering an application's graphics in different levels allows a study of the impact of these features on a user's perceived QoE. In addition, the findings from this study will facilitate an understanding of the relationship between technology adoption, trust in AV, cybersickness and optional feedback mechanisms for each rendered graphics modality.

REFERENCES

Introduction

All companies now operate in an increasingly digital world. However, Small and Medium Enterprises (SMEs) have different challenges when compared with Multinational Enterprises (MNEs). Small enterprises, due to their size and resources, may struggle with digital technologies. This study is aimed at identifying the main requirements needed for the successful implementation of the digital transformation process. The International Institute for Management Development (IMD) has developed a Digital Advantage Framework for Growth and Competitiveness in Small and Medium Enterprises (SMEs) (2017). This framework is designed to provide insights into the requirements needed for the successful integration of digital technologies into the operations of SMEs. The aim of the study is to understand the requirements of SMEs regarding the implementation of the Digital Advantage Framework and to identify the gaps in the current framework.

Maturity Models

A maturity model is an effective tool to provide guidance for a better understanding of the requirements that SMEs need to adopt the digital transformation process. A mature organisation provides insights into the integration of digital technologies that help SMEs to assess their current level of digitalisation. The Digital Advantage Framework must be an integrated tool that not only considers technology but also identifies the areas that need to be improved. The study proposes the following steps to assess the current level of digitalisation in SMEs:

1. Identification of current digital maturity levels through questionnaires and interviews.
2. Assessment of the digital maturity levels from consulting companies and the need for guidance through specific implementation strategies.
3. Analysis of the gaps in the current framework and recommendations for improvement.

Next Steps

- Design an improvement survey to identify the areas that need to be addressed.
- Conduct case studies and analyze findings to identify the latest adoption advantages and recommendations.
- Develop a framework for assessment and adoption techniques to support the implementation of higher-level business processes in SMEs.
- Continuously update the framework to align with the latest developments in digital technologies.

References

Evaluation of Ethereum End-to-end Transaction

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ABSTRACT
Ethereum is a conventional but evolving blockchain approach to support smart contract by enabling Turing-complete computations at runtime. With smart contracts as a back-end support, anyone can publish their Decentralized Applications (DApps), then transfer the existing internet economic applications onto the blockchain. The requirements of service quality for different services can be quite different, ranging from bandwidth-sensitive and end-to-end transaction latency-sensitive. This paper experimentally evaluates the Ethereum end-to-end latency and the factors that smart contract on the Ethereum main-end.

INTRODUCTION
DApps (Decentralized Applications) is a novel way to implement internet applications in a decentralized manner based on the smart contract. The end-to-end transaction latency is one major factor affecting the performance of DApps, understanding the latency and the factors that affect it is very important for the development of DApps. Decentralized transaction latency is the latency from the transaction origination to the receipt of the transaction confirmation on the blockchain. End-to-end transaction latency is caused by the process that the transaction is sent to the client, transmitted across the network, queuing in Ethereum miners, and finally received in the destination. Generally speaking, two factors affect Ethereum end-to-end transaction latency, i.e. the transactions fee that the transaction sender needs to pay to the miners and the transaction volume that the miners need to process.

In our previous paper, we evaluated the end-to-end transaction latency of Ethereum, but the result was not expected. Now we need to evaluate the factors that affect Ethereum end-to-end transaction latency on the main-end because of the different application scenarios, we do not need to consider DApps in this paper.

Capped and collected over 400,000 transaction data samples from Ethereum main-end is analyzed. The data samples are selected from different perspectives:
- The whole of Gas price on the average, median, and variance of the transaction fee
- The relationship between Gas price and transaction amount, i.e. the popular Gas price distribution of the samples
- The need to show that the expected relationship that a higher Gas price will slow down the transaction completion time is not applied. At the same time, the experimental results show a lot of interesting phenomena about the effect of Gas price on the end-to-end transaction latency.

RESULTS
Fig. 1 shows that there are no significant differences in the average transaction completion time with a Gas price between 1 and 100. When the Gas price increases, the latency increases. Fig. 2 shows that the higher Gas price will slow down transaction completion time. The results show that there is a clear correlation between the Gas price and transaction completion time. When the Gas price increases, the transaction completion time increases. But when the Gas price is above 100, the trend of increasing becomes less obvious. Comparing Fig. 3 and Fig. 4, the transaction volume is relatively large when the Gas price is 1, 10, 20, 30, 40 as shown in Fig. 4. However, the average and median transaction completion time does not change much if compared with the transactions with a similar Gas price. As shown in Fig. 3, Fig. 5 displays the Gas price is between 1 and 10, the median time for transaction completion decreases while the Gas price grows. Whereas when the Gas price is more than 10 and lower than 50, the median time for transaction completion time is relatively consistent. For the Gas price higher than 50, the time to complete a transaction increases. Fig. 6 shows that the Gas price is more than 20, the variance time for transaction completion decreases, the variance of transaction time also becomes lower. However, when the Gas price is more than 50, the variance is almost the same.
Qian Wang

MIT-Edge: a MapReduce-based Protocol for IoT Edge Computing with Resource Constraints

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Supervisors: Xiaowei Yue, Bryan Lo, Mill Murray

Introduction
As the Internet of Things (IoT) grows exponentially, the demand for data processing also increases. Cloud computing is a popular choice due to its scalability, but it faces challenges in terms of cost, energy consumption, and delays. Edge computing is proposed to address these issues by processing data closer to the source, reducing latency and improving efficiency.

Experimental Results
A set of tasks are run to verify the feasibility of MIT-Edge and compare its performance with existing approaches. The experimental results show that MIT-Edge is more efficient in terms of resource utilization and response time.

Arms
- Deploy data processing functions according to the capability of heterogeneous IoT devices
- Coordinate the processing tasks to achieve optimal performance

MIT-Edge Design
- Differentiates IoT devices:
  - Processing-capable nodes (MapReduce workers)
  - Resource-limited nodes (Froglaners)
- Task Assignment
  - Define an IoT worker (MapReduce) interface for devices to exchange task scheduling information
  - Construct a shortest path tree with the root of each node
- Task Execution and Maintenance
  - Define an IoT worker (MapReduce) interface
  - Assign processing functions
  - Coordinate the execution of tasks

Conclusions
The rapid expansion of IoT connects more and more devices to the cloud. With this, the potential of these devices could be explored to improve the performance of IoT networks. MIT-Edge proposes a feasible solution that finely considers the resources of each device, deploys tasks on capable nodes, and optimizes the overall system efficiency.
The Context Aware Security Policy Language for Zero Trust Network

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Abstract

With the development of the network infrastructure, the number of devices connecting to networks is increasing. Through this evolution, attacks in a non-trust environment or targeted threats are occurring, compromising the integrity and confidentiality of information. Based on this situation, the need for a robust and autonomous security model is an important requirement. In particular, zero-trust networking is an emerging area of research. This paper proposes a security policy language based on zero-trust, the context-awareness and autonomous security model, to achieve effective and accurate security. The paper introduces the definition and principle of the security policy language, then proposes a formal model that supports the zero-trust and context-awareness. Finally, the paper presents a preliminary implementation and provides experimental results.

Zero Trust Network

Context Aware Security

The PARC policy language is used to enable policy specification and enforcement in the zero-trust architecture. The PARC policy language is the policy language developed by the PARC project and is used in the Zero Trust network. The PARC policy language is a context-aware security policy language that takes into account the context of the security policy when making decisions.

The PARC policy language is a context-aware security policy language that takes into account the context of the security policy when making decisions. The PARC policy language is a context-aware security policy language that takes into account the context of the security policy when making decisions. The PARC policy language is a context-aware security policy language that takes into account the context of the security policy when making decisions.

Future Work

- To evaluate the performance of the PARC policy language in a real-world environment.
- To implement the PARC policy language in a real-world environment.
- To evaluate the performance of the PARC policy language in a real-world environment.
- To implement the PARC policy language in a real-world environment.

Conclusion

In summary, the PARC policy language is a context-aware security policy language that takes into account the context of the security policy when making decisions. The PARC policy language is a context-aware security policy language that takes into account the context of the security policy when making decisions. The PARC policy language is a context-aware security policy language that takes into account the context of the security policy when making decisions.
A Comparative Study of Machine Learning Techniques for Emotion Recognition using Peripheral Physiological Signals

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Introduction
- Emotions in humans produce physical and physiological changes.
- Recent developments in wearable technology have led to increased research interest in using peripheral physiological signals for emotion recognition.

Why peripheral physiological signals?
- Peripheral signals are non-invasive.
- Easily measured through wearables.
- Long-term monitoring.
- Real-time prediction applications.

Methodology
- DEAP dataset.
- Comparison of eight classification models.
- Feature extraction.
- Apply ML models on three different data combinations:
  1. Raw data.
  2. Feature fusion data.
  3. Individual feature data.
- Subject-dependent classification.

Results

<table>
<thead>
<tr>
<th>Optimal</th>
<th>Poor</th>
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</thead>
<tbody>
<tr>
<td>SVM</td>
<td>DT</td>
</tr>
<tr>
<td>LDA</td>
<td>GNB</td>
</tr>
<tr>
<td>Logistic Reg</td>
<td>KNN</td>
</tr>
</tbody>
</table>

Research Question
1. Can we classify emotions using peripheral physiological signals?
2. Which classification model gives the optimal results in classifying emotions?

Future Work
- Sliding Window
- Hyper Parameter Tuning
- Federated Learning
- Create novel implicit metric QoE database
- Deep Learning
Applying Process Mining to Improve Microservices Cyber Security Situational Awareness

Stephen Jacob
Dr. Brian Lee, Dr. Yuansong Qiao

Motivation
Cyber Security Incident Response Teams (CSIRTs) are often overwhelmed by various, more sophisticated forms of cyber attack. Improved cyber security techniques are in high demand. In practice, microservices are emerging as the dominant software design architecture for many applications [1]. The main research questions for this research project are: "Is there any way forward process mining improves the detection of cyber security incidents in a microservices-based domain?"

A research question remains on how global events for exception behavior in software remain and how LST [1] can trigger the realization of potential threats that arise and identify those that prove the greatest threat to their microservices-based applications. The mining of business processes in a microservices-based context requires knowledge about applications for which data are collected. In our previous work, we identified a need to align cyber security events with a set of exception events [2] und simultaneous process mining of cyber attack events in a log of simulated cases [2] and implementing process mining in cyber security processes [3].

Aims and Objectives
The main aim of this project is to provide an overview of the behaviour of microservices-based applications using process mining. The central aim of this project is to determine what microservices-based application is to be mined appropriately. The objectives of this project are:

1. Conduct a wide range of case studies of process mining and develop learning, and their applications in cyber security.
2. Develop an effective approach for cyber security application for anomaly detection in microservices-based applications.
3. Evaluate the performance of process mining algorithms in microservices-based applications.
4. Identify a deep learning algorithm to identify the behaviour of cyber security events.
5. Develop a security detection model for cyber security.

Process Mining
Conventional process mining methods leverage knowledge bases of logs and may require different in the form of process models as shown in Fig. 1. The large datasets created from many events are a major concern. Another approach to process mining is to mine event streams in large log files to detect an anomaly in process execution and make predictions about future events.

Recurrent Neural Networks
A Recurrent Neural Network (RNN) is a neural network whose output is fed back to its input as an additional input and an internal state that acts as temporary memory. The application used here was a data management tool that logged recurrences with the dynamic input from the application log output as part of the Business Process Monitoring Challenge in 2014 [11]. This also was used to test the ability to learn an RNN to learn the business process. The neural network model can then be used to predict subsequent events given an event sequence.

BPIC 2014 Case Study
The application used was a Service Management tool that logged recurrences with the dynamic input from the application log output as part of the Business Process Monitoring Challenge in 2014 [11]. This also was used to test the ability to learn an RNN to learn the business process. The neural network model can then be used to predict subsequent events given an event sequence.

The LSTN model contains a single hidden layer with 100 nodes. It was trained with a dataset of 20,000 samples, where each is a single sequence of events. There were 12 different event types and the largest case consisted 178 events. The neural network was then evaluated on another dataset with a rate of error 95.6% and took 16 minutes to train.

Results
The model was trained with 80% cases and a learning time of 3 hours per case. The model was trained in a capacity of 8GB, by predicting future events. This is the first to use a data-driven methodology with 90 different event classes. The trained model could predict the accuracy of approximately 50%.

References
Cooperative Industrial Multi Robot System using Multi Agent Reinforcement Learning

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Introduction

The motivation behind this research is the demand for flexible automation solutions in highly dynamic and complex environments. The focus is on developing a cooperative multi-robot system that can adapt to changing conditions and perform tasks efficiently. This requires a robust and intelligent control strategy that can handle uncertainties and disturbances in real-world scenarios.

Problem

In current industrial settings, robots are often used for specific, repetitive tasks. However, in dynamic environments, such as manufacturing plants, the ability to adapt to changing conditions and handle unforeseen situations is crucial. Multi-Agent Reinforcement Learning (MARL) offers a promising approach to address these challenges by enabling agents to learn and adapt collaboratively in a shared environment.

Methodology

The proposed system employs MARL to enable robots to learn cooperative behaviors in a dynamic environment. The agents are trained to make decisions based on observed states and rewards, allowing them to adapt to changes and optimize their actions over time. This approach not only improves efficiency but also enhances the system's resilience to failures and disruptions.

Conclusion

The evaluation of the proposed cooperative multi-robot system using MARL shows promising results. The system demonstrates improved performance in dynamic environments, showcasing the potential of MARL in industrial settings. Further research could focus on refining the learning algorithms and enhancing the system's scalability to handle larger numbers of agents and more complex tasks.

REFERENCES


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