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Awakening Health Through Robotics

Douglas Sales Alves Amante

Relatório do projeto de estágio final
Engenharia Informática
(2º ciclo de estudos)

Orientador: Prof. Dr. Nuno Manuel Garcia dos Santos
Co-orientador: Dr. Matthew Ikle

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Resumo alargado

A evolução humana é inevitável, com isto o objetivo do ser humano é conseguir um progresso dia após dia até o fim do processo. Durante esta evolução, a tecnologia tem um papel importante que converge com o objetivo do ser humano. Devido às tecnologias emergentes estarem num desenvolvimento exponencial, a evolução humana se mantém como prioridade na perspetiva humana. Porém, além do progresso de si mesmo, o ser humano tem a habilidade e capacidade de inovar e proporcionar mudanças disruptivas em outros sistemas ao redor de si. O sistema de saúde é uma prioridade, pois o ser humano necessita diretamente de um bem-estar quando preciso, com isto a inserção de tecnologias emergentes, principalmente da inteligência artificial nesta categoria de sistema é essencial. O sistema de inteligência artificial avançado utilizado no projeto *Awakening Health* possui virtudes de capturar dados, identificar padrões baseados nestes dados, aplicar metodologias similares dos humanos com base nestes padrões encontrados para que os mesmos gerem informações e, consequentemente utilizá-las para formarem um conhecimento na arquitetura do sistema de inteligência artificial, como uma emulação de como funciona o cérebro humano.

Para estabelecer um equilíbrio de desempenho entre o conhecimento armazenado e uma interação com um objetivo programado, uma arquitetura de inteligência artificial deve ser agregada com um conjunto de éticas muito bem transparentes. A ética possui uma extrema importância numa arquitetura de inteligência artificial, principalmente no objetivo de uma interação entre ser humano e robô. Quando uma interação é feita a partir destas duas entidades descritas, o sistema de diálogo inserido na arquitetura de inteligência artificial necessita de um limite para que o contexto da interação não crie respostas inconvenientes cuja robô adquiriu de conhecimento. A partir disto, o sistema de diálogo do projeto *Awakening Health* possui metodologias e tecnologias avançadas priorizadas em processos cognitivos, regras baseadas em condição e efeito, reconhecimento de intenção e uma lista de objetivos que é frequentemente modificada. Toda está metodologia e tecnologia utilizada para este projeto necessita de uma reflexão filosófica por parte dos desenvolvedores de inteligência artificial devido a robô não possui esta virtude ainda. Esta ideologia está a ser explicitamente criada pela SingularityNET para o projeto *Awakening Health* para construir a robô humanoide Grace e consequentemente inseri-la no sistema de saúde mundial. Grace conseguirá criar interações baseadas nos seus comportamentos definidos pela equipa do projeto graças à teoria da sinergia cognitiva, as tecnologias e metodologias avançadas que estão a ser utilizadas para atingir o objetivo proposto do projeto.

Este documento descreve o trabalho realizado no contexto do Mestrado em Engenharia Informática na Universidade da Beira Interior e em colaboração com a empresa SingularityNET para desenvolver o projeto *Awakening Health*. O projeto *Awakening Health* possui o objetivo de desenvolver uma robô humanoide denominada como Grace e incluí-la num sistema de saúde, para auxiliar os médicos através de análises de condições dos pacientes, confirmação de sinais vitais, testes cognitivos, exercícios de meditação, interações divertidas de dia o dia,

auxilio de avisos, alarmes e medicamentos. Grace usará uma interação de maneira ética com as pessoas para trabalhar individual e coletivamente em prol do bem-estar do paciente. Seguindo esta abordagem, o primeiro capítulo introduz a ideia deste projeto e o propósito deste estudo e estágio realizado. No segundo capítulo é feita um estudo de caso dos temas importantes para abrir a mente com outras perspetivas que deveriam ser usadas na empresa SingularityNET, usando dois estudos de casos. No terceiro capítulo é apresentado o plano de trabalho incluindo uma breve descrição, como funcionou a comunicação com a equipa do projeto *Awakening Health*, as tecnologias e metodologias avançadas utilizadas na robô humanoide Grace, e a contribuição da minha pessoa para o projeto. Por fim, no quarto capítulo é feito uma conclusão sobre o estágio completado e perspetivas futuras.

Abstract

Many fundamentals are concerned when emerging technologies collaborate to enhance human evolution and revolutionize new systems including such healthcare. The cornerstone of ethics is essential for progress based on the current artificial intelligence scenario. To establish a performance balance between knowledge stored and the aim of interaction, the artificial intelligence system must be aggregated with an ethical base. It emphasizes the significance of not applying all knowledge obtained for inconvenient interactions. As a consequence, the interaction made possible by an advanced dialogue system is prioritized among cognitive processes, rules based on condition-effect, intent recognizers, and a list of goals with philosophic reflections on the purpose of the system. This ideology is being implemented by the SingularityNET to the Awakening Health project to build the Grace humanoid robot in the healthcare system. Grace is capable of creating interactions based on her behaviors defined by the Awakening Health team and employing the cognitive synergy theory to attain the proposed goal.

The present document explains the SingularityNET point of view and also the background of the Awakening Health project, which incorporates artificial intelligence, dialogue systems, humanoid robots, and the opencog hyperon framework. These techniques are theoretically and practically connected, in addition to specific research and advanced technologies. Following this explanation, the contribution to the Awakening Health project is demonstrated, along with many awakening health dialogue system behaviors developed, and the internship concludes with futuristic perspectives.

Keywords

Artificial General Intelligence, Artificial Intelligence, Dialogue System, Humanoid Robot and OpenCog Hyperon Framework.

Contents

List of Figures

List of Tables

Acronyms

ALLab Assisted Living computing and telecommunications Laboratory

AGI Artificial General Intelligence

AHDS Awakening Health Dialogue System

AHL Awakening Health Limited

AHP Awakening Health Project

AHT Awakening Health Team

AI Artificial Intelligence

AMR Abstract Meaning Representation

AWS Amazon Web Service

DAO Decentralized Autonomous Organization

DF DialogFlow

DL Deep Learning

GAIT Genesis Artificial Intelligence Token

GPT-3 Generative Pre-trained Transformer -3

HR Hanson Robotics

HRSDK Hanson Robotics Software Development Kit

IoT Internet of Things

ML Machine Learning

NLP Natural Languague Processing

OCHF OpenCog Hyperon Framework

QA Quality Assurance

SNET SingularityNET

UBI University of Beira Interior

VSC Visual Studio Code

Chapter 1

Introduction

Human evolution is always bringing about disruptive changes in the society. These disruptive changes are done through the use of diverse paradigms, but all changes are passed down through individuals. Humans have a set of skills that they use to advance in their evolution. In this scenario, humans resemble other individuals from this world in that they allow us to study, analyze, conclude, and then create something about these variables that will form a complete intelligence, such as dolphin sociability, dog empathy, aunt communication, horse based on evolved cognitive skills and short-term memory, raven capacity for multi-tasking, pic based on cognitive processes to achieve a lie based on reinforcement-learning, and finally according to all of these individuals, humans can employ advanced technology to assist achieve critical outcomes.

Following the evolution of humans, AI approaches were developed with the goal of providing a better understanding of how the human brain functions and then comprehending the reasons for action and reaction based on an environment in order to maximize the chances of achieving a given goal. Understanding the underlying reason of a decision is key to reaching convergence in the paradigms implemented in the field of AI. The term ”decision” mentioned above is a vital component to distinguishing different types of implicit links with different circumstances. AI systems currently have incredibly high performance due to enhanced AItechnologies and other convergent future technologies that work together with AIto make the system more resilient.

One of the AI applications is in the healthcare system, this type of AI-based application in the healthcare system is growing increasingly popular as a result of people’s desires and concerns about receiving a massive quantity of information in a short period of time. throughout the day and fail to care for themselves, resulting in mental health issues. The demand for dopamine activation in the human brain produced by a big amount of information in a short period of time is eroding mental health, this is a unique issue in neuroscience research with a substantial influence on people’s lives. The Covid-19 disease has a direct influence on people’s mental health as a result of sentiments like uncertainty, dread, and loneliness, and as a result, people’s well-being vanishes.

Robots are being integrated in the same ecosystem as humans to improve people’s well-being and offer a more nice environment for humans. Three important factors must be addressed while building a robot architecture: appearance design, hardware, and software. In a health system, it is critical to maintain a pleasant and sociable appearance through contact before providing comfort to the patient. Due to communication and circuits to integrate all

parts, there are several layers of complexity in terms of hardware. Finally, the most difficult objective is to develop intelligent software capable of absorbing observations, interpreting, reasoning, and arriving at a final judgment. Since a result, the hardware strategy is inextricably linked to the software strategy, as the software strategy will rely on the hardware strategy for input and output dependent on the robot.

Because of technical advancements in the robotic industry, the interaction between human and robot is becoming more common, and people are establishing a conviviality with this conception. Otherwise, each country has a constraint for this advancement, there are countries that are further ahead because they place a great importance on this perspective.However, as a consequence of posts on social media, people are creating a misleading perception of robots. Several digital media outlets claim that robots will disrupt people's lives, robots represent a chance for people to evolve. Humanoids robots are the future, according to this viewpoint. Humanoid robots exist to facilitate human-robot contact, making it more convenient for humans to engage.

The communication is a variable that formalized intelligence, it is critical and a great problem to attain a high performance for this variable. When two entities interact, such as a robot and a user, numerous variables are employed, and the more variables that are used, the more difficult it is to regulate the system. The communication variable is described in a dialogue system that combines a variety of ways and procedures based on rules for comprehension, processing, and learning about any subjects discovered throughout the interaction. As a result, multiple intentions are required, each with the objective of permitting a trigger that will activate rules and subsequently establish a context for the dialogue system.

It is vital to provide a limit to the context while designing the dialogue system, and this context is based on ethics. The term ethics varies from person to person, what fascinates one person may not interest another. In this scenario, ethics provide a significant barrier to the AI system and the development of a dialogue system. Otherwise, with advanced research, it is now feasible to discover various clusters with few changes in ethics and values. As an outcome, a collection of values will yield the ethics term, this term is frequently discussed in the AI field. When the term ethics is used in AI, there are a lot of disagreement since many people do not believe that robots can think and have their own opinions.

The SNET was founded by Ben Goertzel in the field of AI and robotics, with the collaboration of David Hanson, founder of Hanson Robotics (HR). The SNET vision was to create a decentralized ecosystem capable of inserting AI services and products into an AI marketplace using agix tokenenization as reward. As a result, the Sophia humanoid robot was created through a collaboration between SNET and HR. Because of her extraordinary abilities, the Sophia humanoid robot was a tremendous development in technology and human evolution, allowing various investments from corporations, laboratories, and universities to collaborate and continue the advancement the Grace humanoid robot is being built.

The primary purpose of SNET is to design and construct an Artificial General Intelligence (AGI) system. This type of system differs from AI systems in that, whereas AI systems use Deep Learning (DL), Machine Learning (ML), Natural Languague Processing (NLP), and other emerging technologies to solve complex problems, AGI will be able to combine these emerging technologies with philosophic reflections and ethical approaches. Many questions are inserted in philosophic reflections, such as ”What is intelligence?”, ”What is the convergence between intelligence and consciousness?”, ”How understand the mind?”, ”What is the life value and direction?”, ”How explain faith in a god?”, and ”How is creativity inserted in a think’s flow.” The development of an AGI system is slow because a lack of understanding about ”how to build an AGI system” is focused, and the high agreement in ethics approaches is exceedingly unsatisfactory.

This document introduces the work completed at University of Beira Interior (UBI) as part of the Master’s Degree in Informatics Engineering in collaboration with SNET to provide AI services and products to the SNET platform-based AI marketplace. As a result, to contribute to the development of the Grace humanoid robot, which is capable of assisting, diagnosing, and then supporting patients who require comfort and assistance in healthcare systems. Following this reason , the Grace humanoid robot will aid in the advancement of AI investments in the healthcare system.

1.1 Problem Context

As previously stated, the SNET, in collaboration with HR, received several investments as a result of the global success of the Sophia humanoid robot. Following that, the Awakening Health Limited (AHL) Foundation decided to invest in developing a new product known as the Grace humanoid robot for the healthcare system. The Grace humanoid robot’s goal is to assist people evolve and then develop in the field of AI by offering an evolution into the healthcare system, a change of paradigm regarding machines to people’s point of view.

The healthcare system of the 2022s has several issues due to the unneeded engagement of those working in this setting. People are not working with ideas, fresh viewpoints, or ideologies to break out from patterns. As a consequence of the arrival of humanoid robots in the healthcare system to do jobs that humans perform in a pattern, the AHP allows people to have the chance and desire to think and create new things to advance rather than repeating patterns every day.

The human brain is immensely complex, yet because to breakthroughs in neuroscience research technology, it has already been mapped. The issue arises when someone attempts to provide the reason for a particular link or activity of a particular area of the brain. In this view, merely researching the human brain is not enough; comments on the reasons of certain occurrences are also necessary. When these thoughts are produced, certain issues are addressed, and the conclusion will be more complete depending on how many people from

diverse cultures participate in this contemplation. Because SNET is working with many cultures all around the world to develop a balanced set of ethics and adapt the robot humanoids with unique views.

When a disruptive technology changes people's perspectives on the world, the ethical term is important and essential to ensure that the change does not exceed a predetermined limit. The limit is critical to determining where to begin and where to end this tremendous development. In this scenario, when the AHP inserts humanoid robots in people's lives, it would be useful to develop a set of standards for humans to use to judge the worth of stuff.

1.2 Problem Statement

The use of AI in robotics based on healthcare systems is an innovation, and so the responsibility for developing intelligence robots to aid in the health environment is extremely high. As a result, the collaboration among SNET, HR, and AHL was able to begin the AHP to build the Grace humanoid robot. The AHP is working hard to develop a complete AI for the Grace humanoid robot. This system is based on advanced AI methodologies, healthcare system ideology, emotional and ethical interaction between human and robot, and an appropriate robot architecture based on design appearance, hardware, and software. he AHP is on track to achieve extraordinary results because Grace humanoid robot is using advanced approaches dedicated to materials of first quality to apparence design to healthcare system, an advanced Hanson Robotics Software Development Kit (HRSDK), and the use of OCHF as an emulation of the human brain.

Considering the described process and the identified problem, the key question that this work seeks to answer is:

• **How does one create an AI system capable of producing a humanoid robot with ethics and values capable of coexisting with humans? Then, people will allow interaction without regard for vanity.**

1.3 Document Outline

This internship report is organized in such a way that the reader understands the development of the work:

Chapter 1. It includes a brief introduction, company description, and problem description to clarify the context of the internship.

Chapter 2. In Chapter 2, the viewpoints of GenesisAI and OpenAI were studied in order to supplement the internship realized, but from various points of view that were crucial for understanding what the SNET required to advance and achieve the top were provided.

Chapter 3. Background information was required to comprehend the created work under investigation, which includes the following: Summary, interaction with the AHDS team, Grace robot's emerging technologies, and contributions to AHP In Grace robot's emerging technologies was included a brief summary of the following significant methodologies: OCHF, and dialogue system containing system of goal, intent and coded interaction approaches.

Chapter 4. The conclusion and future thoughts are included in Chapter 4.

Chapter 2

Case Study

The goal of this section is to present two works that are relevant to the SNET worldview. First and foremost, both GenesisAI and OpenAI should be commended on their outstanding work. They have the potential to contribute significantly to the advancement of AI-related research. The first piece of evidence comes from GenesisAI, which created an unusual approach to the AI business. The AI marketplace, according to GenesisAI, is accountable for becoming a platform where AI services and products are based[1]. As a result, SNET views the AI market similarly. The community's benefit, on the other hand, varies dramatically between the two techniques outlined. To make payments to the community, the GenesisAI employs the Genesis Artificial Intelligence Token (GAIT), whereas the SNET uses the agix token, which has a strong investment potential due to its possibility to attain a high value on the financial market in a few years. In fact, GenesisAI shares three major barriers to globalization in AI innovation: a lack of connectivity, high operating costs, and difficulty monetizing AI code [2].

The second case study is a brilliant piece of work by OpenAI that synchronizes with the AHDS to Grace's future perspective. Because of its ability to extract plans as to what the user wants to know before saying anything using approaches such as cloze test, question-answering, and translation, the OpenAI work known as GPT-3, which represents a natural language processing model, was critical in opening the mind to new methodologies [3]. Understanding the convergence of human-machine interaction was required to improve the Grace dialogue system's compatibility with GPT-3 ideology. According to the findings of both studies, as well as all methodologies used and applied at Grace humanoid robot in the AHP, I hope to answer the following questions in the final report:

• Will the viewpoint of actual life change over time of the disruptive transition from a centralized to a decentralized ecosystem?

• How can the set of ethics of each diverse culture around the world be standardized in order to generate decentralized AI agents with heterogeneous knowledge?

2.1 GenesisAI

GenesisAI is a finance-based decentralized marketplace for AI services and products. The goal of this decentralized system is to allow interaction between AI agents in a marketplace represented by an AI network [4]. This AI agents methodology is based on AI interaction in an environment that employs this approach to mention a participant capable of interacting with another AI agent into an environment, which environment should be the marketplace [5]. As little more than a practical matter, GenesisAI intends to create the first marketplace model for a global AI network using the GAIT. The GAIT can be used to represent a sell or a buy with other AI agents in the AI network, and it also serves to reward the AI network's community. This token also has priority access to the GenesisAI AI network as well as a high level of transaction security based on blockchain technologies [6]. The mission of GenesisAI's protocol in this context is to work within GenesisAI AI networks and establish direct communication with Amazon Web Service (AWS) and ML methods to supplement the functionality of AI services and products. Finally, the GenesisAI marketplace integrates bidirectional interaction into the AI network, which includes a reputation system and connects businesses in need of AI services with businesses interested in monetizing AI code [7].

The supervisioned learning method emerges in the field of AI, more specifically in ML methods. It is a type of AI learning that can use previous experience to create a comparison with new data when it is introduced into the AI network [8]. As a result, GenesisAI decided to incorporate this methodology into the GenesisAI AI network. With this ideology in place, GenesisAI may acquire expertise by combining data from different companies and ML methods. It is very interesting due to the sheer necessity of allowing the company to be prepared for new challenges that other companies already have and errors or negative outcomes occur. As a result, GenesisAI employs this ideology to prepare for unexpected outcomes, but the supervised learning she has acquired prepares her for it. Following this reason, the GenesisAI utilizes a path to solve the problems for AI innovation globally, following outline the path to solutions:

Problem 1: No connectivity - Solution: Protocol for communication: The lack of connectivity can be remedied by utilizing the GenesisAI protocol, which is being developed to network Ethereum-based smart contracts. The GenesisAI intends to communicate in networking using several emerging technologies, as well as to supplement the AI marketplace with AWS [9]. GenesisAI intends to create its own AI communication protocol, it will be capable of establishing a decentralized economy based on AI-to-AI communication. A decentralized economy will also enable the monetization of AI code and AI services developed globally [10];

Problem 2: Expensive to use - Solution: Providing a low-cost and quick AI solution: GenesisAI operates its own web-platform through which interested AI agents can obtain AI services and products. However, the decentralized economy can solve a problem created for centralized entities due to the high cost of using AI technologies [11]. As a direct

consequence, actual businesses no longer require the hiring of software developers who work long hours developing or altering current AI systems. Users will be able to request a specific AI service or product and then pay for it with GAITs due to GenesisAI's AI communication protocol, and the AI protocol will then update the AI code based on the company's desire;

Problem 3: No way to monetize AI code - Solution: AI marketplace: The GenesisAI point of view enables the community to interact with these emerging technologies in order to create a decentralized economy. In the 2022s, this viewpoint eliminates the high costs associated with centralized entities providing AI services. As a result, the AI marketplace is critical for AI agents to share their experiences as they integrate into the GenesisAI AI network and then build a global brain to decentralized economy [12].

The GenesisAI uses Web 3.0 methodology to adapt new technologies and introduces a group-based consensus mechanism to validate AI network quality. The goal of this group is to achieve a good balance of decentralization and computing power efficiency. Because of this good balance, computing power, along with the tokenization component, has always been an important factor in these types of systems. The tokenization ideology is simple: it uses reinforcement learning to reward contributions to the GenesisAI AI network. The goal of reinforcement learning is to achieve a goal and then reward the learner with something. It employs ML methods [13]. According to GenesisAI, the tokenization in this case is the GAIT. When an AI agent, for example, submits something in the AI network, the AI communication protocol evaluates and analyzes the best training using a specific model for this activity. A transaction into the GenesisAI AI network, in fact, has three stages:

Stage 1. A specific AI agent submits to the Ethereum-based smart contract a data set for training, a purpose for the model that will be created, and a reward amount that can be distributed to another AI agent participating in networking;

Stage 2. The AI communication protocol with a specific AI agent evaluates the quality of the model and assigns a score based on the results;

Stage 3. The tokenization rewards will then be distributed to a specific AI agent based on this transaction into the GenesisAI AI network, while another AI agent active in this transaction will receive the new model for use based on the initial purpose solicited.

2.2 OpenAI

The OpenAI ideology is based on the idea that a machine can perform intelligent tasks that a human can accomplish. In this scenario, OpenAI establishes a ML-based goal of writing articles efficiently and learning from them. Based on previous writing, the model would be able to learn a specific skill and then apply that skill to new writing. Consider the importance and advancement of creating machine-machine ethical interaction rather than human-robot

interaction [14]. OpenAI prioritizes this viewpoint as a determinant for advancing the AI field. The GPT-3 is the model developed by OpenAI in this scenario. This model includes 175 billion parameters in the model structure. As an outcome, the GPT-3 excels at three distinct approaches to furthering this model [15]:

Approach 1. Cloze Test: The goal of the GPT-3 model cloze test is to replace a space void with the same context word and continue writing in the correct language. AI developers use this method to remove a word from a sentence, leaving only a void space. The GPT-3 model must then find a word in the same context to fill in the blanks;

Approach 2. Question-Answering: The question-answering approach aims to make it easier for the GPT-3 model to find answers based on various personalities, such as caring, enthusiasm, friendliness, professionalism, and wit in new article writers;

Approach 3. Translation: The translation approach enables the GPT-3 model to support and understand the following languages, and then write contexts in those languages: Chinese, English, French, German, Italian, Japanese, Korean, Portuguese, and Spanish.

The GPT-3 model was created for training and evaluating under three different conditions: ”zero-shot,” ”one-shot,” and ”few-shot” learning. As shown in Table 2.1, the basic idea behind these conditions is to increase the number of examples of previous interactions with a specific task from a context learning experience.

Model	Task description	Context	Condition	Example		Prompt
GPT-3	Simplified Chinese to English translation	Cheese	Zero-shot			Cheese
			One-shot	山地	Mountain wine	Cheese pairs well with mountain wine
			Few-shot	山地	Mountain wine	In places where the weather is cold, many people enjoy cheese and montain wine
				寒冷天气	Cold weather	
				很多人	Many people	

Table 2.1: The GPT-3 model involves a translation approach to a chosen context with three conditions to gain specific knowledge.

The GPT-3 model produces 74 pages on average, which is an important feature that allows these articles to be created at a low energy cost. As a result, the advancement of this model shares a methodology for establishing safe AI, and the OpenAI prioritizes that four recommendations must be followed to ensure that cognitive processing model to robotics has a limit [16].

Recommendation 1. Risk assessment and forecasting: The OpenAI research strategy can provide a good grasp of the future of AI. Because of the black box and no-limits detailed to AI concerns, the AI future is unpredictable. Measuring and forecasting risks is a technique for enhancing system resilience for worldwide collaboration with government

transparency;

Recommendation 2. Methods for improving human feedback: The OpenAI proposals use a range of strategies based on cognitive neuroscience research to train models with the goal of accomplishing tasks that are more balanced than human tasks. The major goal of cognitive neuroscience-based OpenAI is to improve the system of human feedback replies and subsequently to create machine feedback in the future;

Recommendation 3. Truthful and honest AI: The OpenAI agrees and then provides truth systems in a decentralized economy that develops truthful mechanisms in Web 3.0. The OpenAI hopes that multiple initiatives in diverse domains will collaborate to produce definitions and concepts that will p+enable AI researchers in generating solutions with integrity.

OpenAI, which is actively establishing a global point of view based on judgment and ethics from many perspectives around the world, has referenced all of these recommendations. Because of the rapid development of cognitive models for AI systems, AI developers are allowing people working with this developing technology to broaden their horizons. When an AI developer from anywhere in the world solves an issue based on a human work, the larger solutions are compounded by diverse points of view to produce decentralized AI agents with heterogeneous knowledge from across the world [17]. It happens despite the fact that AI experts are eager to open the code and share it with everyone via GitHub. As a result, in order to attain a trustworthy AI to global development, AI ethics is a large branch that can be broken into various tiny technology-specific branches. Moral behaviors can be used to divide ethical beliefs, which can then be mimicked in AI systems. As a result, based on chatbot interaction simulations, OpenAI offers six influences of these moral behaviors that differ depending on people from different cultures: Age, genre, interest, nationality, politics, and religion are all factors to consider. [18]. The work plan utilized to accomplish this internship will be identified in Chapter 3.

Chapter 3

Work Plan

The SNET is redefining AI, and it is only feasible due to a vast worldwide collaboration of outstanding engineers all working toward the same objective. As a result, SNET is now engaged in a number of projects aimed at exploiting emerging technologies and progressing in the field of AI. Table 3.1 lists the primary projects that can be updated on a regular basis.

	Project	Emergent tecnologies	Working	The ultimate goal
SNET platform	Awakening Health	AI and robotics based on healthcare	To control a nursing assistant robot, create a dialogue system in collaboration with a vision subsystem	Able to provide healthcare assistant technology, a robust set of AI tools at an unprecedented low cost and assist patients all over the world
	Deep Funding	AI and AGIX tokens based on Web 3.0	Create a specific AI service and make it available on the SNET platform	Build a network of decentralized and beneficial AI services
	Nunet	AI, cryptography and blockchain based on computing resources	Scalable computing resource sharing and monetization	Start giving decentralized networks globally distributed, optimized computing power
	Rejuve	Medical research-based AI	Traditional medical research should be incorporated into AI methodologies	Resolve the aging issue
	SophiaDAO	AI and robotics based on Decentralized Autonomous Organization methodologies	Create AI models that are crucially creative	Develop an effective ecosystem in which people can contribute to the design of intelligent machines

Table 3.1: The SNET platform is currently being used to develop the five projects.

The work strategy for my internship was based on the AHP because of my abilities with ambient assisted living technologies and my experience in Assisted Living computing and telecommunications Laboratory (ALLab) at the UBI, with Nuno Garcia as my advisor. The internship was in management and was scheduled to begin in October 2021s and end in June 2022s. Based on the work plan, this portion was separated into four approaches: summary with a description of the tasks completed during the internship, interaction with the team sharing as was communication between I and all the AHDS team, Grace humanoid robot's emerging technologies demonstrating the three main keys following: OCHF, humanoid robot, and dialogue system used in Grace humanoid robot, and finally my contribution to the AHP.

3.1 Summary

The AHP was a paradigm-changing endeavor that used emerging technology like the Grace humanoid robot to change the healthcare sector. The Grace humanoid robot was designed

to help the elderly by guiding them through exercises and meditation, measuring their temperatures using a thermal camera, and conversing with them on a variety of themes using her behaviors. Grace humanoid robot can express emotions through encounters with the user as a result of the AI advantage technology. The goal of this internship program was to help build a new product that will benefit and improve people's lives. As a result, the AI field has earned a considerable competitive advantage in terms of research and development as shown in Table 3.2, this is how the tasks done during the internship were divided:

• **Task 1:** Understanding the scope and objectives of the AHP;

• **Task 2:** Install and configure the Grace humanoid robot environment on my machine;

• **Task 3:** Begin developing new behaviors for Grace humanoid robot-to-user interactions based on the AHDS;

• **Task 4:** Writing the internship project report;

• **Task 5:** Insertion of the system of goal methodology into generated behavior rules;

• **Task 6:** The AHDS is now being tested in a specific context;

• **Task 7:** Writing the final internship report.

	Oct	Nov	Dec	Jan	Feb	March	Apr	May	Jun
Task 1	X								
Task 2	X	X							
Task 3		X	X						
Task 4		X	X	X					
Task 5				X	X	X			
Task 6						X	X	X	
Task 7							X	X	X

Table 3.2: Timeline from October 2021s to June 2022s with the aim of sharing the internship completed.

Throughout this internship sponsored by SNET, I hope that my contribution to the Awakening Health Team (AHT) will be centered on two objectives. First, I want to better comprehend the AHDS then I will can improve my NLP skills. The second objective is for me to be able to engage and contribute with insights into the field of AGI from all around the world.

3.2 Interaction with the Team

Because of digital advancements, the Covid-19's consequences enable remote work with facility and dynamic work. This type of work allowed me to grow as a person throughout the

internship by allowing me to adapt to new surroundings. The main benefit of remote work was the intensive and productive work, but the main disadvantage was the loss of a human touch to have face-to-face conversation. The AHDS team consisted of 15 active participants. Due of the time difference, contact was continuous and intense throughout the program. It was always possible to interact with someone via social platforms such as Slack and Zoom about problems or new strategies. On Slack, users may join a variety of separate channels, each of which served a specialized function. For example, I did not take part in robotic programming. My interaction with the dialogue system channel, on the other hand, was intense. All participants from the AHT met on Zoom once a week. Using the graph in Figure 3.1, the nations, number of participants, and interaction force percentage that each participant had with me in the project can be recognized based on the location of each member of the AHDS around the world.

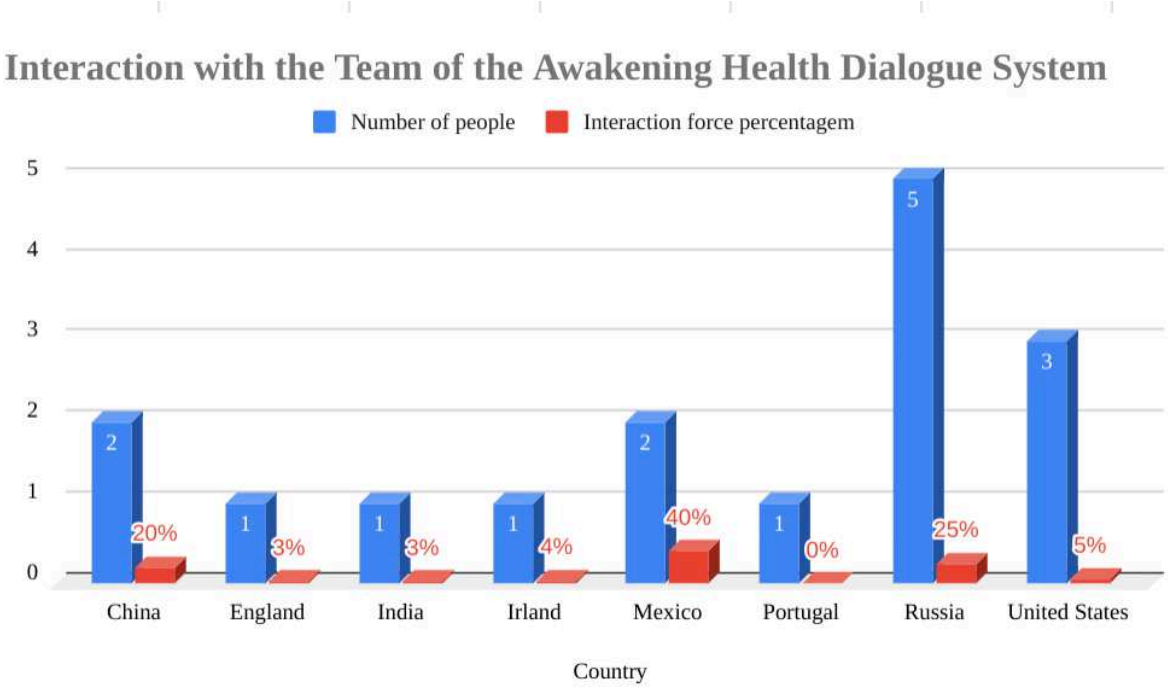

Figure 3.1: The iteraction with the AHDS team was based on three essential variables, which are depicted in graph form.

3.3 Grace Humanoid Robot's Emerging Technologies

Grace humanoid robot's section on emerging technologies focuses on presenting the main methodologies used at the SNET internship program. Grace humanoid robot was built to be a humanoid robot, and the section on humanoid robots will explain what that implies and what Grace humanoid robot's purpose is using this methodology. Another portion describes the OCHF, which was utilized to design the Grace humanoid robot brain and may create crucial cognitive processes through synergy cognition. Finally, the dialogue system, which is based on AI advancement, is another developing technology considered in this report. DL, NLP, and DialogFlow (DF) techniques are major methodologies employed in dialogue system in this context.

3.3.1 OpenCog Hyperon Framework

The OCHF intends to merge AI advanced technology with cognitive neuroscience philosophies to accomplish AI architectural replication of any power from the human brain. The design concept was influenced by the cognitive theory of synergy, which states that all AI modules in an AI architecture must collaborate to achieve the goal. These OCHF-based AI modules include a variety of AI agents that collaborate to achieve a local goal and then a global goal to AI architecture [19]. AtomSpace is an OCHF AI module that stores the learning obtained feature in this situation using dynamic weighted and labeled hypergraph knowledge. As a result of the reasoning generated by AI agents functioning in this specific AI module, this AI module creates some knowledge to share with other OCHF AI modules. Because each AI module requires interaction, the AI agents in OCHF must cooperate and assist one another in order to achieve the local goal and then the global goal. In cognitive neuroscience investigations, this collaboration amongst AI modules to assist achieve the goal is formalized as the cognitive synergy approach. Figure 3.2 depicts the OCHF's AI architecture.

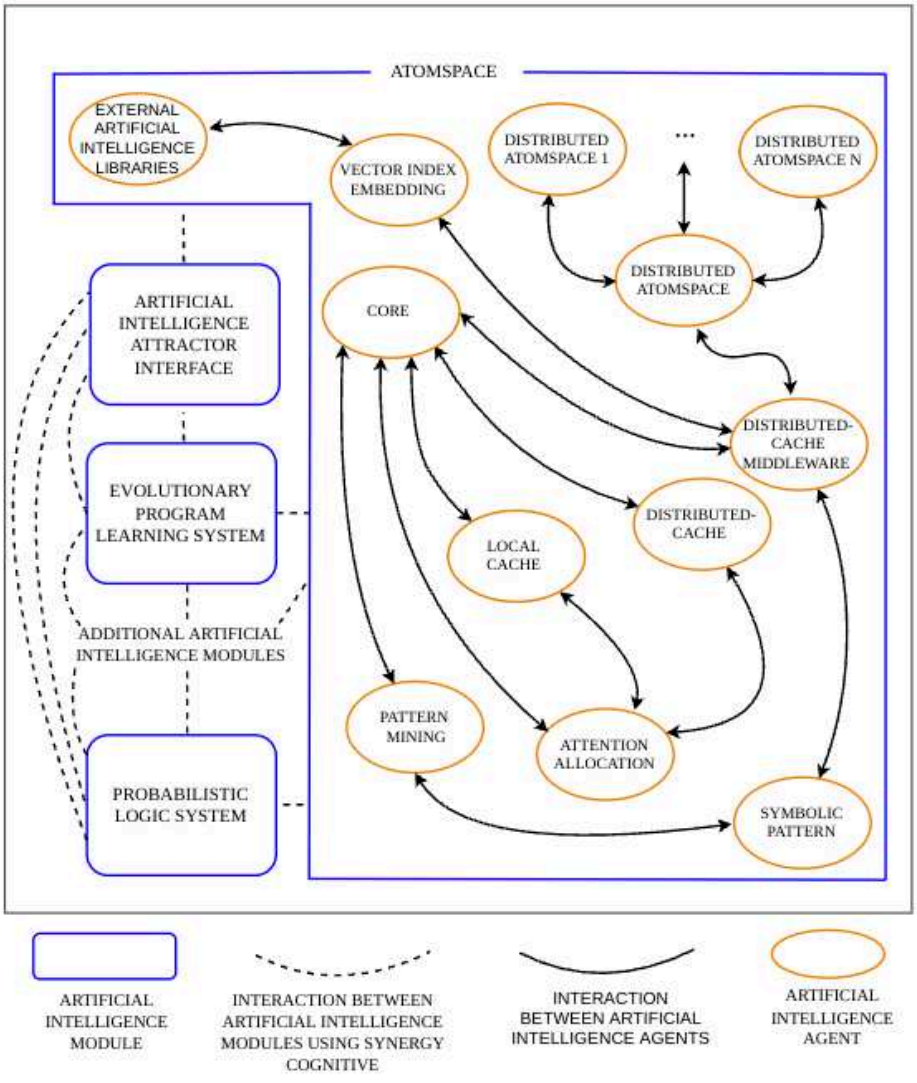

Figure 3.2: A representation of the OCHF based on AI modules and agents.

The OCHF was designed to enable flexible experimentation with an AI architecture by applying AI modules and then AI agents with local and global goals. In this context, OCHF comprises the following AI modules: a probabilistic logic system, an attractor neural networking interface for attention allocation, an evolutionary program learning system, an atomspace core to database for storing knowledge, and other AI modules. The atomspace module, which acts as a hypergraph, is the core module based on OCHF. A hypergraph's fundamental characteristic is that links can point to links rather than nodes, and this feature can also point to sub-atomspaces, which are referred to as distributed atomspace agents. Because of the need of preserving and sharing knowledge from multiple perspectives, it is a critical advantage. Each distributed atomspace agent is programmed to work from a separate perspective, and each distributed atomspace agent will try to fulfill the local goal [20]. Following that, utilizing the hypergraph technique, it may be feasible to find a global aim by sharing perspectives among every scattered atomspace active.

As a consequence of the OCHF study's findings, the AI module atomspace was designed to store knowledge as a local cache agent or a distributed cache middle-ware agent. This configuration to activate the local cache agent serves the aim of temporarily storing any knowledge, and when this agent is switched off for an extended length of time, all knowledge stored in this specific agent is removed. This agent's principal purpose, on the other hand, is to facilitate faster communication and knowledge sharing with other AI agents in the atomspace module. Otherwise, the distributed cache agent tries to store the knowledge permanently, where it will remain until some process deletes it. As a result, the distributed-cache middleware agent, as well as the embedding vector index and pattern mining agents, coordinate and oversee the process of producing distributed atomspaces. All knowledge is generated through the interaction of AI agents inside the same AI module. However, the interaction process is limited because an AI agent cannot interact with a specific AI agent of another AI module, and AI modules interact with other AI modules.

The embedding vector agent calculates and analyzes which dimension is ideal for storing knowledge based on distributed atomspaces. It uses probabilistic logic network inference methodological control in addition to the embedding vector to aid in space division, and it interacts with all external AI libraries that are being used. ML, DL, NLP, voice, and vision libraries all require interaction processing. The attention allocation agent, according to the atomspace module structure, is a cognitive processing that selects which knowledge should be pushed from the local cache agent to the distributed cache agent. Its objective is to share something stored in the local cache atomspace agent that is necessary for use in any active distributed atomspace agent.

Finally, the core atomspace agent is where context control takes place around all interaction activities to achieve the overall aim. As a result, it is critical to understand that this global aim can be altered at any time through an automated procedure [21]. The context processes are based on pattern mining and symbolic pattern index agents, with the pattern

mining agent evaluating and providing feedback to the core atomspace agent if the specific global context is appropriate and then sharing it with the symbolic pattern index agent, and the symbolic pattern index agent creating a context local to each distributed atomspace agent active and communicating it with each. To achieve high collaboration among AI modules, the OCHF is based on three principles aggregate with synergy theory [22]:

• **First Principle:** It is based on the fact that the atomspace module is only used within the random access memory of a single computer. In contrast, a Postgres backing store has been added, allowing the use of numerous single-machine atomspace in a decentralized architecture;

• **Second Principle:** It is based on the pattern matcher mechanism, which is used in the atomspace module's pattern mining agent. The goal of the pattern matcher is to perform a large number of program execution and inference operations in order to detect any pattern matching around the context produced with the core atomspace agent;

• **Third Principle:** The connection of the AI attractor inference module and the external AI libraries agent underpins the third principle. This confluence's purpose is to achieve a neural-symbolic characteristic. The neural-symbolic methodology is most useful for capturing symbolic and logical reasoning to the context.

3.3.2 Humanoid Robot

Humanoid robots are based on robots that resemble humans in appearance. In reality, HR has made great progress toward its aim of developing robotics designers who are more human-like [23]. SNET, AHL, and HR are working together for developing the Grace humanoid robot product to AHP. SNET works to design and develop intelligence software, AHL works to manage the behaviors based on healthcare systems that Grace humanoid robot is interested in and to find various investors for the project, and HR delivers humanoid assembled robots to the AHP.

Saudi Arabia made history by appointing Sophia, the world's most advanced humanoid-robot, as the country's first robot citizen. As a result, HR and SNET have teamed up to achieve lofty goals in AI and robotics. Grace humanoid robot, Sophia's sister, was the next step in the evolution of humanoid robots. While the purpose of Sophia robot is to share her learned abilities with people all around the world and attract additional investment. Grace humanoid robot's purpose is to help doctors diagnose illnesses and administer treatments in healthcare systems. The Grace humanoid robot can be identified as ready for a certain demo in Figure 3.3.

Figure 3.3: Grace humanoid robot is getting ready for a demo in Hong Kong.

3.3.3 Dialogue System

Humans rely on communication to understand and learn about many aspects of the world. As a result, the value of utilizing machines is reflected in the dialogue systems. DL techniques for NLP, comprehension, and production have boosted the usability of dialogue systems dramatically [24]. However, such systems' ability to understand language remains a fantasy, especially in task-oriented domains where dialogue systems need be integrated into an agent performing real-world operations with substantial error costs. Virtual assistant dialogue systems often incorporate a large number of abilities that conduct external actions using knowledge-enhanced neural models but are implemented independently [25].

AHDS is essentially based on rules that describe its interactions with the user, including both verbal and nonverbal triggers and replies. The standards obtained from the interaction design process are used to codify how such interactions are implemented. As explained in the

system of goal, a given interaction is normally defined in a ruleset with a specific goal, which can include connected rulesets including subgoals. Each ruleset contains one or more rules that specify the desired interaction, each of which consists of a condition and an effect. Both conditions and effects may have both verbal and nonverbal components. If the components of a rule require behaviors that the system does not yet provide, the interface designer can create functions that will be called by the rules.

Intent recognizers, such as Abstract Meaning Representation (AMR) templates, DF, and regular expressions, analyze user phrases. The intentions to be utilized in rule conditions must be clearly expressed by the coded interaction. A more powerful intent recognizer than the ones now in use might significantly enhance system performance, and this is a research path worth pursuing [26]. Instead, it would be more comfortable to design a visual user interface to assist the work of intent generation, rule and coded interaction definitions terminal to increase the usability of the interaction coding system. It is vital in the AHDS to refer to three subjects that are based on this section. First is the system of goal that is connected with the coded interaction methodologies, after that intent to be detected by user words, and then activate any rule in coded interaction. Lastly, the purpose of coded interaction of combining numerous rulesets.

3.3.3.1 System of Goal

To regulate, alter, and develop the AHDS, the system of goal methodology was included. The AHDS outperformed the AHT despite the fact that goals were kept as key-value structures in an array. Only one goal can be active at any given moment. To make the system more useful, it is possible to add alerts when a certain goal is active, fallbacks when no rules were triggered during rule processing, and then have the system reply with a specified phrase and goal priority. In this context, each aim can be given a priority rating ranging from ”very low”, ”low”, ”medium”, ”high”, and ”very high”. Because new goals are added after the others and the last goal added will be the first goal to be active, this technique is crucial for the system to keep control of the situation. Figure 3.4 shows the system of goal flow, which is initiated from a list with all goals kept locally. Finally, the goal’s structure mandates the following fields:

• **Name**: The goal’s name;

• **Parent:** If the goal is a sub-goal of another, the name of the parent goal will be stored in this field;

• **Status:** The goal’s current state;

• **Status-details:** Additional information on the current status of the goal;

• **Sub-goals:** A list of sub-goals for this goal.

As a result, the following values can be assigned to a target status:

• **Active:** This goal is currently being worked on;

• **Done:** All steps necessary to achieve the goal have been completed;

• **Paused:** The goal was paused because it was interrupted by another goal;

• **Stopped:** The goal was stopped, normally because the ”@stop” intent was interpreted from the user;

• **Waiting:** Every new goal is assigned this status while it awaits activation;

• **Wait-response:** The system is waiting for the user to respond;

• **Wait-subgoals:** This goal's subgoals are being processed. When all subgoals are completed, the goal's status changes to completed.

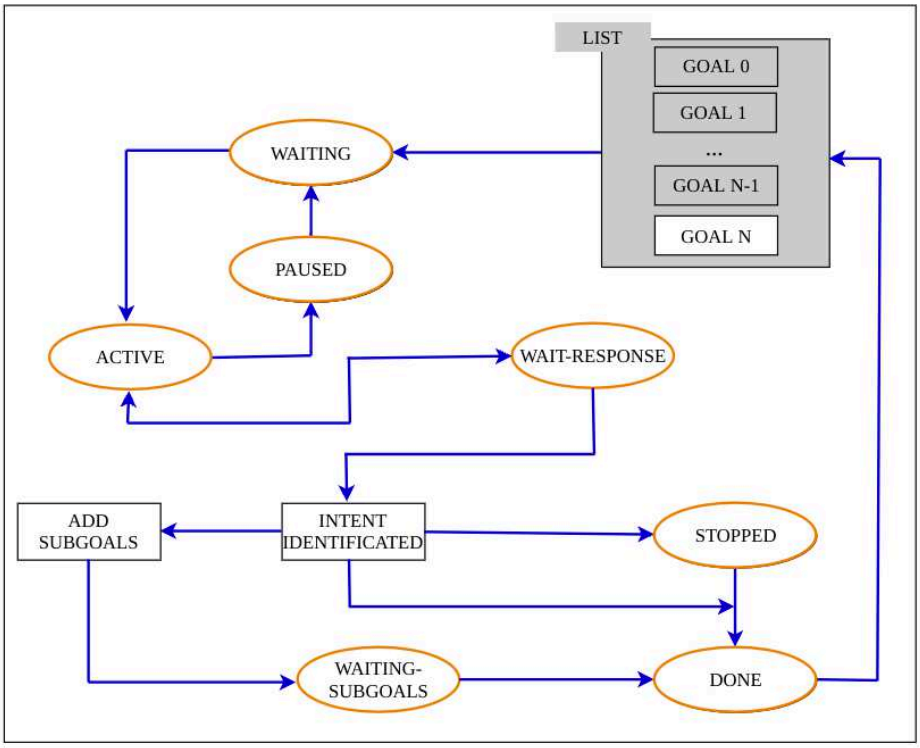

Figure 3.4: The representation of a flow based on a system of goal.

3.3.3.2 Intent

When a user says or types anything, the AHDS matches the user expression to the system's best intent. The AHDS is based on the condition-effect technique, in which the user refers to a context, which then activates an effect based on purpose classification. In this context, the AHDS presents several samples of what the user can say throughout the discussion to this specific purpose, and the system matches the intent when the user's expression resembles one of these sentences. Otherwise, because AHDS includes built-in augments for understanding comparable sentences based on ML methods, it is not required to identify all conceivable cases [27].

In the AHDS technique, three sorts of intent recognizers are used: AMR templates, DF, and regular expression. In English, the AMR templates are based on a semantic representation that incorporates graph ideology. Following that, the AHDS intentions can also be built on regular expression methods, with the goal of locating a series of letters in a sentence that provides a search pattern. Furthermore, DF is Google's supervised learning platform to NLP, which allows all of the platform's capabilities to be leveraged to combine a user interaction with the AHDS. Table 3.3 displays four unique intents used in the AHDS and based on DF intent recognizer: "@ask-start-cogtest", "@tell-joke", "@start-meditation", and "@say-non-english".

	Intent from	Intent name	Phrase		Objective
AHDS	DF	@ask-start-cogtest	"Please start a cognitive test", "Please start a cognitive quiz", "Can you please start a cognitive test?", "Can you please start a cognitive quiz?"		Grace will start a cognitive test
	DF	@tell-joke	"Grace, do you like jokes?", "Grace, could you tell me a joke?", "I love jokes, tell me a joke.", "I would like to hear a joke"		Grace will tell jokes
	DF	@start-meditation	"Can you help me to meditate?", "Could you help me to meditate?", "Grace, Could you guide me through meditation?", "Grace, Let's do a mediation"		Grace will begin meditating
	DF	@say-non-english	"Say something in $lang", "Please, say anything in $lang", "Grace, can you say something in $lang?", "Can you speak $lang?"	**Parameter** $lang = @sys.language	Grace will communicate with the user language by using Google's DF shycronization with the parameter $lang

Table 3.3: A deception of a specific case in which four different intents are employed to direct the objective at each other based on AHDS.

As a consequence, the parameter "@lang," which is a variable of type "@sys.language" based on system entities referenced by DF, may be used to identify the "@say-non-english" intent. Its purpose is to determine the context language using Google technologies and then translate the Grace humanoid robot information to any language. The AHDS, on the other hand, is built around hundreds of intents for usage during a user discussion. As a way, different intentions can be merged to produce a full dialogue.

3.3.3.3 Coded Interaction

The coded interaction to AHDS idea is to deal with condition and then effect dependent on context. In general, a condition is a dictionary of key-value pairs that is used to validate what the user says. As a consequence, one or more dictionaries with comparable key-value combinations may be built and allocated to the AHDS's actions. When there is a list of effects, they are executed in the order that they are listed, and the next effect may be depending on the outcome of the preceding effect. An intent key can be applied to both conditions and effects. Table 3.4 displays four programmed interactions: "cognitive test," "joke task," "meditation practice," and "quick medical check," each with its own ruleset to build a user interaction based on identified intentions and then loaded to activate defined rules.

	Coded interaction	Objective	System of goal		Intents used
			Goal	Sub-goals	
AHDS	Cognitive Test	Grace will administer a cognitive test to the user	cogtest-req	say_result, ask_to_remember, count_backwards, ask_month_count, ask_year and ask_month	@stop, @no-cogtest, @general-agree, @general-decline, @say-month-count, @ask-month-count, @say-current-year, and @ask-start-cogtest
	Joke Task	Grace will be able to tell four jokes	joke	tell-joke	@positive-reply, @general-decline and @tell-joke
	Meditation Practice	Grace will collaborate with the user to create a meditation	meditation-practice	meditation-final-question and do-meditation	@stop, @positive-reply, @general-decline and @start-meditation
	Quick Medical Check	Grace will perform a quick medical examination between the user and the doctor	quick-medical-check	remind-doctor-visit, temperature-taking and announce-medical-check	@stop, @positive-reply, @general-decline and @quick-medical-check

Table 3.4: A demonstration of AHDS based on four coded interactions and the system of goal methodology..

3.4 Contributing to the AHP

Using the web platforms Confluence and Jira, the AHP's manager the flow of information submitted to the AHT. The purpose of the Confluence platform is to create a remote-friendly team workspace with a variety of tools to help in team interaction. The Jira platform then adopts an agile work management solution strategy with powerless collaboration across all team members. This agile approach to work management is based on Scrum, a methodology for completing a complicated project in less time and with fewer resources. When a large project is broken into smaller pieces, several sprints are developed, with each sprint attempting to reach a solution based on lowering the time and resources spent in a specific area of the large project [28]. To move the AHP forward and generate another sprint, the preceding sprint must be finished and authorized by the project manager. As a result, the AHT set several tasks for Grace humanoid robot to do for each demo requested, and each sprint has particular duties to complete. To evaluate the weight of this specific work to the real sprint, each Jira task contains the following fields: the priority, the AI developers who are accountable for the specific task, and a reporter who has the mission of maintaining the

status of this task.

The AHT lacks a consistent integrated development environment for creating the codes required by the reporter. Because of my familiarity with Visual Studio Code (VSC), I opted to utilize this particular integrated development environment for codding. The VSC was an excellent concept because it includes a debugger for usage when necessary, connectors with Docker containers for testing the code, and the ability to interface with GitHub for controlling the branch utilized and making pull requests for new code insertions. The following programming languages were necessary for this internship: Python, C++, Haskell, Scheme, Rust, AMR templates, and Java Script. At the time, the great complexity of integrating codding in diverse programming languages was a substantial barrier. C++, Scheme, Haskell, and Rust were utilized to investigate the code produced for the OCHF, which served as a background to Grace humanoid robot. Other programming languages, such as Python, AMR, and Java Script, were also utilized to develop Grace humanoid robot interaction rules directly.

The cycle-life of a task was crucial to the AHP due to the overall team's communication. To ensure that the project manager maintains a high level of performance, the task status in Jira must be continually updated. To keep open lines of communication, the AHT's project manager said more with the reporters, and then the reporters interacted with the AI developers of a given assignment. As a consequence, the AHT determined the real condition of a task using the following statuses:

• **Canceled:** The task was canceled due some reason by AHT's project manager;

• **Done:** The AHT's reporter accepted the preview review created by AI developer;

• **In progress:** The AHT is working at this specific task;

• **On hold:** It means that the AI developers cannot act on a specific task until a new decision made by AHT's reporter;

• **Quality Assurance (QA):** An AI developer from the team created a pull review on GitHub to reporter analyze the exchanges made on the code;

• **To do:** None AI developer from the AHT started the task.

Grace humanoid robot was able to conduct a range of actions based on user engagement tasks set by the AHT. These behaviors were based on the five methodologies described as: avatar, dialogue, emotion, Internet of Things (IoT), and navigation. The avatar methodology was designed to serve as an interface for testing Grace humanoid robot's performance without requiring the physic robot to be activated. The objective of the dialogue was to increase Grace humanoid robot's engagement with the user by introducing new subjects to her,

which Grace humanoid robot could then discuss in order to develop a deeper grasp of many diverse circumstances. The emotion's primary purpose is to achieve affective computing for emotional interactions with users. Grace humanoid robot can recognize and communicate with smart sensors in an area due to the IoT methodology. Finally, the navigation strategy is supporting Grace humanoid robot in detecting and grasping her true location in an environment where she is engaging with the user. As a consequence, Table 3.5 has a description of each Grace humanoid robot behavior.

Deliverable	Qualitative assessment of the functionality	Status
Dialogue		
Questions and response understanding	Asking questions and comprehending basic responses, such as yes, no, and maybe	Done
Cognitive quizzes	Using cognitive quizzes to keep the user's mental health in good shape	Done
Intention recognition	Yes, no, agree, disagree, not understanding, a desire, a request, make an appointment, and so on	Done
Medical-related question and answering	Adding more medical contexts, like Covid-19 and general domain contexts	Done
Meditation exercises	Perform meditation to assist the user in maintaining good performance health	To do
Selective auditory attention	Ignoring people who are conversing in the background	To do
Interruption handling	Stop talking while the user is speaking, and then follow up	To do
Make a joke	Grace tells one of four jokes that can be easily expanded upon request	Done
Converse with two or more people	The current dialogue system is capable of handling this, but the AHT does not yet have any rules in place	To do
Answer questions about herself	Grace's life story information works well	Done
Ask and remember person´s name	It works well. However, if the user does not provide a name, it may enter a confusing loop	Done
Navigation		
Positional and movement commands	It is useful for moving left/right/forward/backward for a specific distance or "a little," as well as turning left/right/around/for a specific degree	Done
Go to person direction	It goes well with "where is person?"	Done
Colision avoidance	It works, but given the position of the sensors at the mobile base, it may fail if an object has a wider upper part, such as a table	On hold
Emotion		
Emotion expression through facial expression	The awakening health team can use the rules to trigger any available emotion	Done
Avatar		
Make avatar available for AI developers	It works well in both server and client modes	Done
Building the avatar	The AHT is currently employing an avatar within HRSDK. It was sufficient for development, but in the future, the AHT will need to create the own avatar	QA
IoT		
Temperature taking	It performs admirably with simulated temperature readings. There is insufficient hardware for accurate temperature measurement. When such a reading becomes available, the awakening health system will notify the user	Done

Table 3.5: The AHDS behaviors for providing the last demo requested in Hong Kong.

As a function of Grace humanoid robot's actions, a specific task referred to as a "joke" that was introduced on the dialogue method will be further examined around here to demonstrate how it was planned and handled until all functions necessary for this assignment were finished. As a consequence, the joke task was separated into six sub-tasks:

• (1) **Implement basic joke setup:** It intends to design and develop a simple joke setup based on coded-interaction and intents programming;

• (2) **Insert the system of the goal methodology into basic joke setup:** With the development of this new AHDS methodology, it was necessary to incorporate it into coded-interaction;

• (3) **Implement telling four jokes instead just one joke:** Grace humanoid robot used to tell just one joke. Now she can tell four jokes with repetition;

• (4) **Allow no jokes to be repeated:** It was necessary to devise a strategy to prevent Grace humanoid robot from repeating the same joke;

• (5) **Make a pause between the joke's question and answer:** When Grace humanoid robot told the joke to the user, she should add a few seconds between the joke question and answer;

• (6) **Inform the user that Grace no longer has any jokes:** When Grace humanoid robot has completed reciting all of the jokes she knows, the user must be notified.

From a design viewpoint, it is possible to identify in Figure 3.5 a simulation of this interaction between both when the user will request some jokes and the Grace humanoid robot will strive to fulfill the specified aim of giving jokes to the user.

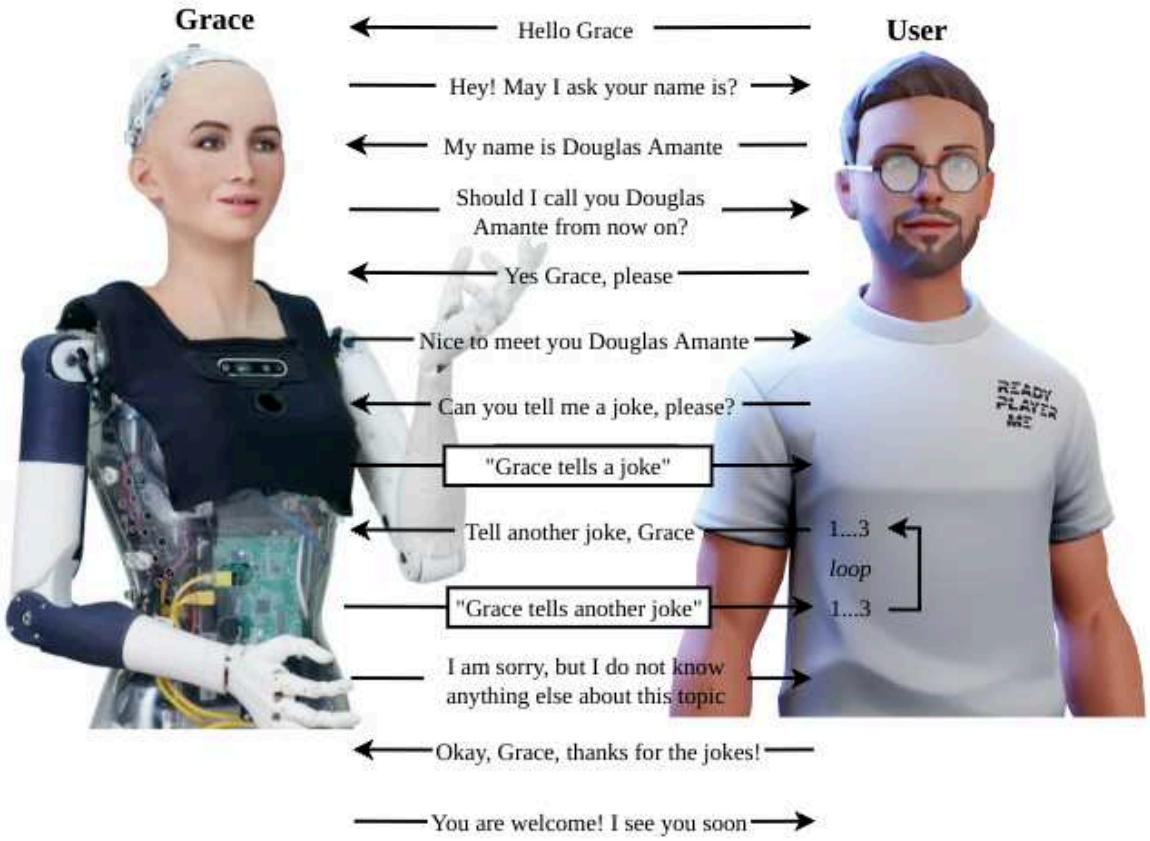

Figure 3.5: Based on the joke task, a simulation between the user and Grace humanoid robot was constructed.

The contribution to the AHP enables considerable knowledge regarding advances technologies based on emerging technologies and tools to management throughout the project's cycle-life. The conclusion of this document will be identified in Chapter 4.

Chapter 4

Conclusion

Along with the internship offered by SNET provided a fantastic opportunity to learn theories and practices in the field of AI. As a result, dialogue system approaches were widely utilized at the time, and I grew exponentially with NLP abilities to an interaction between the user and robot. The condition-effect technique combined with the use of intentions has a critical viewpoint. When an intent recognizes anything, an activation is triggered in the dialogue system architecture. Furthermore, I had the privilege of working at the AGI conference 2021s, which was a virtual and face-to-face conference in the United States.

According to Table 3.1, the SNET platform envisions the creation of various types of projects in various fields to formalize a decentralized ecossystem, such as the following: awakening Health in the healthcare system, deep funding in Web 3.0, nunet in decentralized computation, rejuve in the biology system, and sophia Decentralized Autonomous Organization (DAO) in a DAO for building many humanoid robots in the same environment.

Figure 3.2 with an OCHF representation showed the high theoretical and therefore practice capacity of power in Grace humanoid robot, demonstrating that the OCHF's developers had a large complexity to design this framework. The next stage is to try to include AGI perspectives into this framework by developing new AI modules for representing certain human characteristics like as courage, creativity, generosity, patience, respect, and vanity.

In terms of future development, this author recommend developing a strategy that allows Grace, the humanoid robot, to learn and retain new information through interactions with users. If the user says something new to her, Grace will absorb the knowledge and learn from it. Moreover, AI specialists from across the world should share a set of principles to help AI developers continue with the study and development of AI systems.

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