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Review on Humanoid robot using Jetson Nano

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ABSTRACT

Humanoid robots are robotic system used to mimic human emotions and interactions for human benefit. The aim of this research project is to develop a smart social robot showing sufficient intelligence to work as a guide in different environments. In doing so, both a software and a hardware architecture are proposed, the jetson nano processor is used to control different modules, such as microphone, cameras, platform, face, voice, and others. For its navigation, the use of a known visual map can help to obtain an accurate localization, but in the absence of this map, a guided or free exploration pathway must be executed to obtain the image sequence representing the visual map. Our base paper presents an appearance-based localization method based on a visual map and an end-to-end Convolutional Neural Network.

INTRODUCTION

Guidance and information-providing are promising services for social robots. Many robots have already been developed for daily contexts, such as museums, expositions, reception, shops, stations, and shopping malls. We are also trying to create a robot that could act as a guide in which jetson nano will act as our microprocessor to run our machine learning codes, We will be using tensor flow along with python for software development. The electro-mechanical assembly will be done using servo motors and Arduino to control our 3D-printed parts which are more mobile.

LITERATURE SURVEY

***Biel Piero E. Alvarado Vásquez, Fernando Matía* [1],**From this research project,we learned to develop a smart social robot showing sufficient intelligence to work as a tour guide in different environments. We need both software and hardware architecture.The different modules such as a laser, cameras, platform, face, and voice, among others, control the different components of the robot. Those components are in turn used by other modules designed for navigation and interaction. A sensor fusion for the purposes of localization is implemented by means of an Extended Kalman Filter, which is one of the navigation module components, together with the proposed fuzzy controllers needed for path following. A fuzzy emotion system that controls the face and the voice modules also form part of this architecture for assisting interaction. Finally, all the modules are controlled with a customized programming language that is a mixture of C, Pascal, and JavaScript. The modules are optimized for immediate execution to achieve realistic human–machine interaction.

***Z. Albarakeh, S. Alkork, A.S. Karar, S. Said, T. Beyrouthy*[2],**From this paper, we got the idea that an upward push in the fine art of robotics will subsequently bring about in addition to them altogether of our everyday lives. Since those robots opted to personalize the power to move, act, and talk like people, subsequently they may be going to be won't update people in sure minimalist responsibilities or risky situations. The recent evaluation suggests an accumulated hob by in such concern due to the latest handiness of a few businesses humanoid robotic as glaring via way of means of the growing variety of guides consistent with year. The presence of such business humanoid robots decreased the monopoly of AI labs on AI evaluation and allowed a variety of investigators to determinea large number of subjects that had been hard to recognize due to the dearth of robots. Socially interactive robotic robots are greater researched presently than ever. Robots' behavior and interplay are primarily based totally on human feeling intelligence activity, behavior interpretation, and speech recognition. Such robots might be prepared to well know aperson's kingdom and description the ideal response supported by their predictions. We are capable of believing a huge shape of programs for such robots, like amusement, education, and services. During this paper, we're going to be reviewing the latest updates in social robotic robots. Further, we can be discussing a framework for imposing a humanoid robotic (Pepper) as a carrier bot at some stage in that environment.

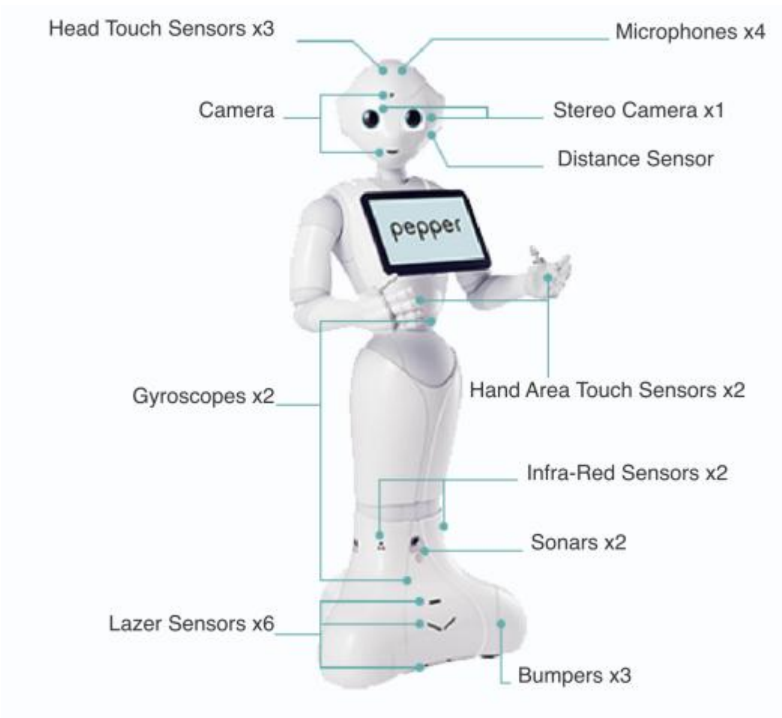

Fig 1: Pepper the Robot

***C. Jayawardena et al* [3],** This paper taught us the first version of a mobile service robot designed for older people. Six service application modules were developed with the key objective being successful interaction between the robot and the older people. A series of trials were conducted in an independent living facility at a retirement village, with the participation of 32 residents and 21 staff. This paper discusses the challenges of deploying the robot and the lessons learned. Results show that the robot could successfully interact with people and gain their acceptance.

Iio, T., Satake, S., Kanda, T. *et al.* [4],We learned about an autonomous human-like guide robot for a science museum. It identifies individuals, estimates the exhibits at which visitors are looking, and proactively approaches them to provide explanations with gaze autonomously, using our new approach called speak-and-retreat interaction. The robot also performs such relation-building behaviors as greeting visitors by their names and expressing a friendlier attitude to repeat visitors. They also conducted a field study in a science museum in which our system basically operated autonomously and the visitors responded quite positively. First-time visitors on average interacted with the robot for about 9 min, and 94.74% expressed a desire to interact with it again in the future. Repeat visitors noticed its relation-building capability and perceived a closer relationship with it.

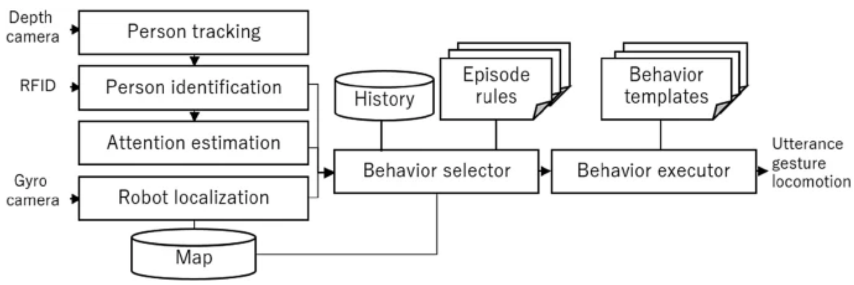

Fig 2: System Architecture

***E. Ovalle-Magallanes, N. G. Aldana-Murillo, J. G. Avina-Cervantes, J. Ruiz-Pinales, J. Cepeda-Negrete and S. Ledesma* [5],**From this paper we learned that Autonomous robot visual navigation is a fundamental locomotion task based on extracting relevant features from images taken from the surrounded environment to control an independent displacement. In navigation, the use of a known visual map helps obtain an accurate localization, but in the absence of this map, a guided or free exploration pathway must be executed to obtain the image sequence representing the visual map. This paper presents an appearance-based localization method based on a visual map and an end-to-end Convolutional Neural Network (CNN). The CNN is initialized via transfer learning (trained using the Image Net dataset), evaluating four state-of-the-art CNN architectures: VGG16, ResNet50, InceptionV3, and Xception. A typical pipeline for transfer learning includes changing the last layer to adapt the number of neurons according to the number of custom classes. In this work, the dense layers after the convolutional and pooling layers were substituted by a Global Average Pooling (GAP) layer, which is parameter-free. Additionally, an L_2 -norm constraint was added to the GAP layer feature descriptors, restricting the features from lying on a fixed radius hypersphere. These different pre-trained configurations were analyzed and compared using two visual maps found in the CIMAT-NAO datasets consisting of 187 and 94 images, respectively. For evaluating the localization tasks, a set of 278 and 94 images were available for each visual map, respectively. The numerical results proved that by integrating the L_2 -norm constraint in the training pipeline, the appearance-based localization performance is boosted. Specifically, the pre-trained VGG16 and Xception networks achieved the best localization results, reaching a top-3 accuracy of 90.70% and 93.62% for each dataset, respectively, overcoming the referenced approaches based on hand-crafted feature extractors

PROPOSED METHOD

Mithra the guide robot will act as a local guide for any person entering the campus to show different departments and different offices. For the robot to show this kind of behavior first it should understand the mapping of the college, We will use Artificial Intelligence and machine learning to teach the robot the map and of the college and localize itself within the system. We will use several Servo Motors for the robot's electro-mechanical assembly to make the robot’s behavior more human-like and provide a non-vocal form of communication. Omni wheels are used for the locomotion and movement of the robot these wheels allow movement not only in one direction but it has a degree of freedom in different directions which allows unconstrained movement of the robot with a good speed.

Jetson Nano acts as the core of our project nano is used to control all the other modules in this project modules as the camera, microphone, speaker, etc. are used to assist the robot in speaking and face recognition. We have used voice recognition and a chatbot-like voice response system so that the robot appears more human-like to the user or person who is asking for the location. An excellent battery management system is needed to give power to every module in the robot and to recharge the robot at the time of low power.

An electro-mechanical assembly that resembles human behavior is needed to make the robot more human-like and more interactive the robot will also have access to the institutional database so as to mark attendance and get other relevant information from the institutional database this information can be used to make the robot more interactive and more intelligent. We can use the operating system provided by Nvidia for the Jetson module this operating system is provided with up gradation by the Nvidia team so the software is always up to date this upgraded software can heavily influence the performance of the module this will give a faster rate of convergence and can help in faster processing of machine learning codes and algorithms in the nano

CONCLUSION

Humanoid robots always work with many pros and cons. When we see it in a technical way, it is a wonderful breakthrough for the entire technology with a lot of future scopes, but in the case of social mean it gives so many new opportunities as well as disappointments. Technically, the most intelligent kingdom is cloned as a robot that gives the same functionalities that a human can do, which opens a wide opportunity for the developing industries and institutions in the world by increasing their attractiveness of them. 'Mithra' the humanoid robot is a guiding robot with a smart and intelligent assistive system madeina cost-effective and efficient manner for commercial and institutional use. Socially it causes unemployment because it can do work as same as a guide and an assistant and it can be used instead of these posts. Developing technology has a vital role in the development of a country. 'Mithra' is not only a guide for the destination we need, but she is also a guide for the future of technology.

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