

Pepper

Hospital Food Service Robot

Project Document



Food services:

Food order

Patient combo

QR payment

Automatic delivery

Team for Pepper Hospital Food Service Robot

of Students from High School Senior

High School Affiliated to Zhejiang Normal University

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Background

1. Why we come up with this project

Our teammate Youran Chen's grandpa got sick recently. As Chen went to see her grandpa, she found it takes too much time for patient to get a lunch order in the hospital.



The nurse was so busy with confirming, recording, and nursing for patients, that there was little time for food service.

Chen had learned something about Pepper robot at school, and she came up with an idea that we can let Pepper help the nurses in the hospital to serve food for patients.

Background

症状：恶寒重、发热轻、头痛身痛、无汗、咳嗽吐稀白痰、鼻塞流鼻涕

风寒感冒

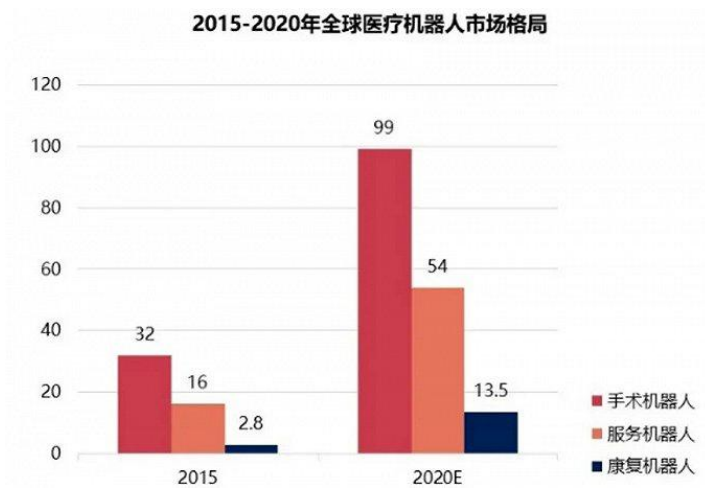
饮食建议：清热解毒、高蛋白、富含维生素

1. 葱白粥+水煮蛋+苹果
功效：驱散风寒+补充蛋白+补充维生素

2. 紫苏粥+鸡胸肉+橙子
功效：驱散风寒+补充蛋白+补充维C

返回

2. The global demand is great



1. Policy

With the increase of labor cost and aging population, The Chinese government strongly supports the development of service robots.

2. Demand

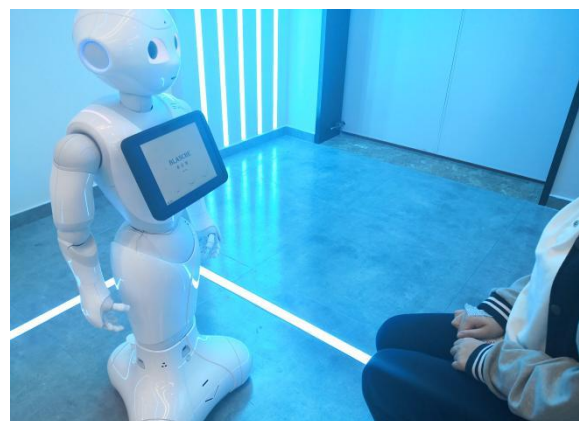
As the left image shows, recent years the global demand of service robot increases fast.

Introduction

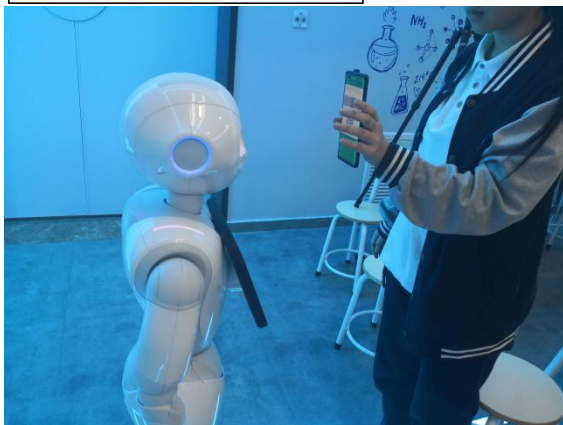
Combo recommendation



Food order



QR payment



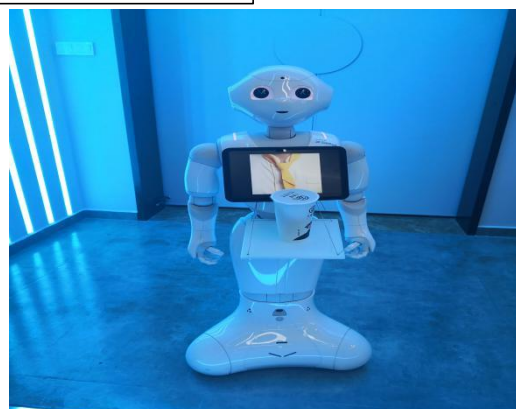
QR disease identification



Face recognition



Food delivery



Introduction

Manual



AI

Pepper

Hospital Food Service Robot

It's a robot with programs designed by our team, and can be used in hospital for patients in need to recommend, order, delivery food and take payment, in the form of human-computer interaction, voice prompt and Multi-Media.

How it works

When the robot heard someone, it goes to the sound position and gets ready for food service. Patient can let it recommend combo depending on the illness, or choose anything. Then patient pay with QR code.

After receiving the payment, the robot capture the patient, delivery the food and finally give food to the patient through face recognition.

Automatic

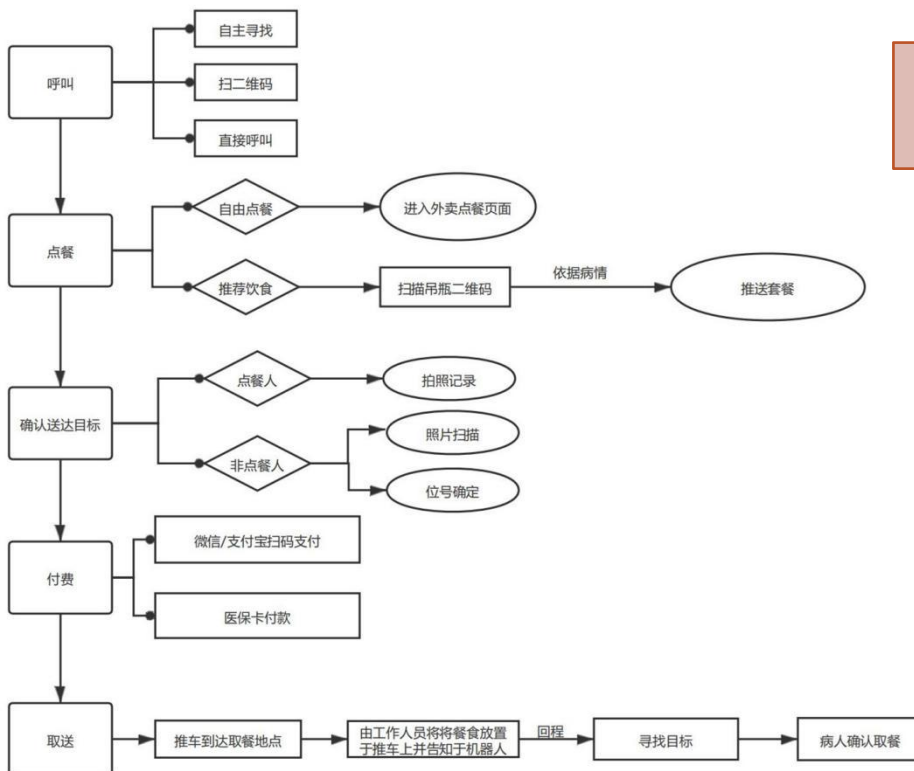
Intelligent

Design concept

Safety

Convenience

Intelligence



Introduction

Our Capability

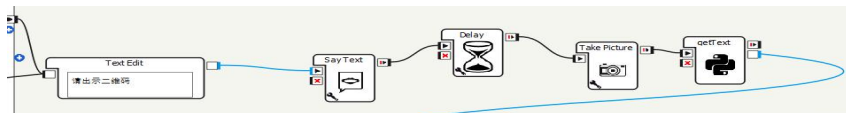
Service Advantage

We can confidently say that Pepper Hospital Food Service Robot is an intelligent application system that can effectively solve the problem of low efficiency of ordering and delivering food for hospital service personnel. The technology and functions contained in it can effectively solve the complicated, dangerous and inefficient procedures of manual service, and can completely replace manual ordering and delivering food. In addition, for patients with mobility difficulties, especially those who are alone, the pepper robot greatly facilitates their life and gives them company and warmth in a unique way.

Techs Advantage

Firstly, we use voice locating so that patients don't need to walk to the robot.

Secondly, we use QR code recognition to let pepper recommend the food and get payment without any physical money.



Thirdly, we use face recognition to make sure the food is delivered to the correct person.

Techs we have

Voice Locating

Listening



Locating

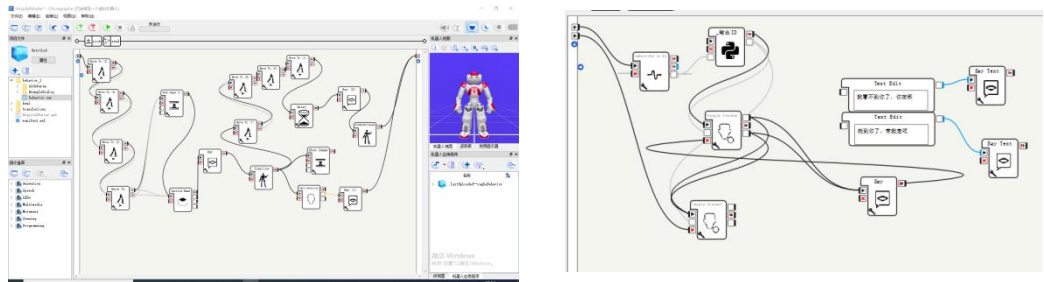


Moving

Users do not need to move, they can call the nearest robot directly in situ, and pepper robot will receive it accurately

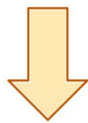
After receiving the human voice accurately, the robot will transform the sound information into data information, process it, and further determine the direction of the sound source, so as to achieve the purpose of accurate positioning

After successful positioning, the robot will automatically go to the location, that is, the user's location, according to the program settings, so as to provide better services for users



QR Code

recognition



Recommend

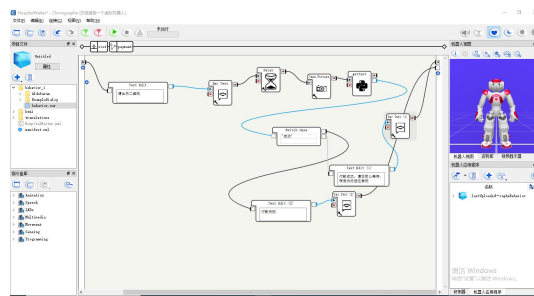
The pepper robot will determine the patient's condition and analyze it according to the two-dimensional code scanning on the patient's infusion bottle

Through the analysis of patients' condition, pepper robot can recommend appropriate diet according to different patients' condition

Illness

Food

Recommen



```

1 import base64
2
3 from urllib import urlopen
4 from urllib import urlopen
5 from urllib import urlopen
6 from urllib import urlopen
7
8 import urllib
9
10 class QRCodeScanner(QRCode):
11     def __init__(self):
12         self.url = "http://192.168.1.100:8080"
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98     def __init__(self):
99         self.url = "http://192.168.1.100:8080"
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101

```


Techs we have

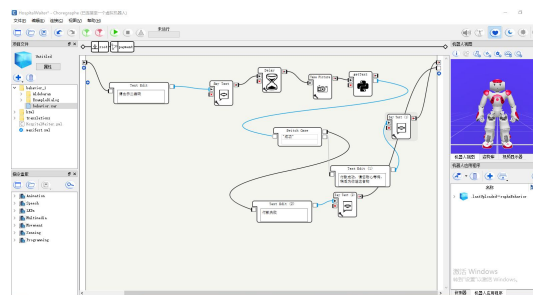
QR Code Payment

After the patient orders, the robot will settle the order according to the program settings, and show the bill details to the ordering person

After the ordering person confirms the bill, the robot will prompt the ordering person to show his mobile phone QR code for payment

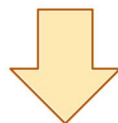
Ordering patients to open the payment code of WeChat or Alipay, and turn the mobile phone to the robot eye.

The robot's eye camera will scan it and complete the payment



Learn face

Pepper robot will scan and learn the face of the patient after confirming the order, so as to

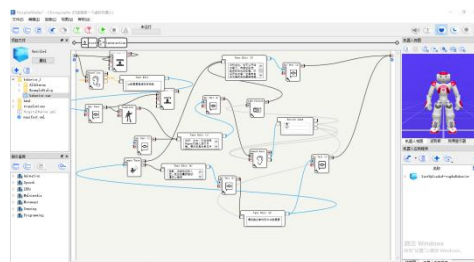


Face

In order to ensure the accurate delivery of the food, the robot identifies the face of the patient according to the learning record of the patient's face

Recognition

Look for



```

1 import rospy
2 import time
3 from cv_bridge import CvBridge
4 from cv2 import cvtColor, findContours, minAreaRect, rotate, warpAffine
5 from cv2 import imread, imencode, imshow, imgcodecs
6 from cv2 import VideoCapture
7 import cv2
8 import numpy as np
9 import sys
10 import os
11 import math
12 import random
13 import pickle
14 import logging
15 from threading import Thread
16 from queue import Queue
17 from sensor_msgs.msg import Image
18 from std_msgs.msg import String
19 from geometry_msgs.msg import Pose
20 from visualization_msgs.msg import Marker
21 from visualization_msgs.msg import MarkerArray
22 from visualization_msgs.msg import Text
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24 from visualization_msgs.msg import TextArray
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```

About Our Team

What we did and what we learned

在前期，队员们的想法天马行空，且各个想法都很诱人，所以我们在敲定制作方向时很是纠结。在经过几次严密讨论后，考虑到市场需求、机器人独特的优势等，我们最终敲定做医院送餐送餐专业机器人。接下来，如何将想法实现是**最艰巨的任务**。首先，团队最需要攻克的技术是人脸识别。

团队成员首先系统学习了神经网络学习技术，了解了人脸识别的基本原理和需要掌握的技术

团队在各种的资源分享网站查找资料，例如中国大学生 MOOC，CSDN 博客，以及国外最大的编程分享交流网站 Github，学习了人脸口罩识别的基础理论。也在百度 EasyDL 上进行了基础的学习型模型训练，了解到人脸识别就是通过人工智能深度学习，训练比对的模型，分析各个人脸的图片，转化为信息，通过**人工智能神经元**判断，得到比对结果，识别是否是同个人。

尽管只是了解了基础的原理，但是对于后期调用 **API 接口** 提供了理论基础的帮助。团队也尝试运行了 Github 上分享的程序，但是程序**并不兼容 Pepper 平台**，只是提供了一种方法，必须基于 Pepper 智能机器人这一开源平台开发相对应的程序。

因此，想要实现人脸识别只有调用 **API** 这一条路可走了。于是，团队开始了对 API 数据接口的摸索，一段时间后，已经能通过 API 接口的官方文档实现简单的接入，编写了天气预报、新闻播报等小程序。了解了 API 调用的全过程，以及整个原理。但是，人脸识别的调用不是这么简单的，团队面临拍摄好人的面部照片后却面临着无法顺利传输的问题。

团队开始在指导老师的帮助下对该问题进行研究，在经历了数次成功与失败后，最终团队调通过接百度云 API 访问百度人脸识别的数据，摄像头追踪人脸，拍摄了来者的面部图片，**通过 Python 转换为 base64 的编码格式，通过 Urllib2 上传到百度 API 接口，得到返回的 json 数据，从而实现对面脸各部位精确的识别。**对于接口数据的分析上传以及数据的接收分析，其中存在的技术屏障也于好几个夜晚的钻研中被解决，当 Pepper 机器人第一次识别成功，团队成员心中的喜悦与成就感是无法言说的。

About Our Team

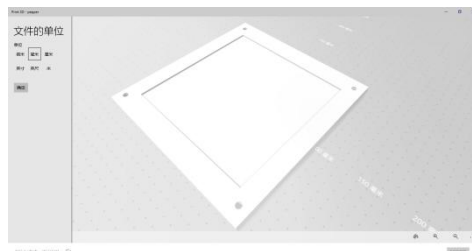
Thanks to guys from 3D Print Club for help

3D 打印

团队研发的“Pepper 医院送餐机器人”一大实际难题是托盘。Pepper 机器人的手部无力无法举重物，背包不利于食物的拿取与防止，为此我们团队讨论出了一系列方案，最终决定用 3D 打印的形式打印出托盘，后绑在机器人最有力的部分——腰部。

先通过计算机动画建模软件建模，再将建成的三维模型“分割”成逐层的截面，从而指导打印机逐层打印。

打印机通过读取文件中的横截面信息，用液体状、粉状或片状的材料将这些截面逐层地打印出来，再将各层截面以各种方式粘合起来从而制造出一个实体。



所有的付出 终会有回报

About Our Team

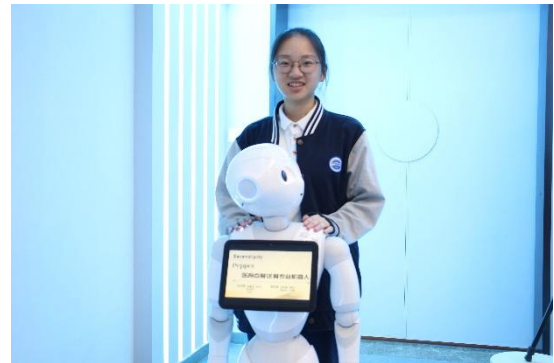
Jieyu Zhu (Leader)

—Lead, and also be responsible for the Food Order development.



Lan Lu (Developer)

—Be responsible for the Food Delivery development.



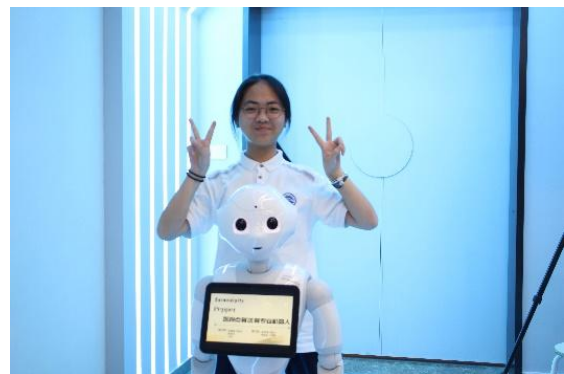
Youran Chen (Developer)

—Be responsible for the Voice Locating and Interface development.



Zhihan Chen (Designer)

—Document, images, videos.



Yijin Zhu (Designer)

—Flow chart, PPT, images.

Development Log

2021. 04. 22

- Draw flow chart
- Try Pepper' s moving function

2021. 04. 27

- Design menu images
- Design interface
- Design illness code
- Try food delivery

2021. 04. 29

- Draw program diagram
- Start document
- Design food options

2021. 05. 04

- Improve interface
- Set up real scene
- Design moving path

2021. 05. 06

- Start PowerPoint
- Design actions
- Solve the problem of QR code recognition

2021. 05. 11

- Improve document
- Design video script
- Improve the program

2021. 5. 13

- Design posts
- Take and edit videos

2021. 05. 18-20

- Finish video
- Improve some details

Pepper

Hospital Food Service Robot



- Safety
- Convenience
- Intelligence