

Machine Learning Camera

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Abstract

There are many tasks for which machines are unsuited due to their inability to think creatively and to recognize approximate patterns. However, using Machine Learning techniques and a certain level of image processing we can teach a machine to recognize images as well as a human can.

Image Processing Program

- Noise reduction
- Edge detection
- Vectorization

Machine Learning Program

- Sample Set
 - A sample set containing several thousand vectors and values is given to the Machine Learning Algorithm.
- K-Nearest Neighbors
 - The K-Nearest Neighbors Algorithm gives an answer based on the sample set.

How it Works

- The camera takes a picture which is given to the Image Processing Program to be processed and turned into a vector which can be used to represent the image as a point in several dimensional space.
- The Machine Learning Program searches through a sample set of premade and labeled vectors and finds the K elements which are closest to the input vector in several thousand dimensional space. It compares them and gives an answer based on what those sample set entries are.
- The user then has the option to tell the machine if it was correct, adding more accuracy to future runs by increasing the size of the sample set

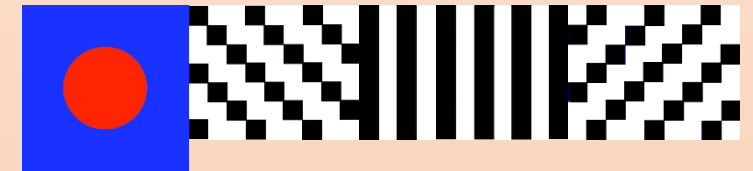


Hardware

- Raspberry Pi 3 Model B+
- Logitech USB Webcam

Trinity Firefighting Robot

- Identifies target patterns
 - Finds a cradle
 - Finds a safe exit
- Designed to integrate into larger robot



Target patterns for the machine learning camera

Implementations of Computer Vision

- Self-driving cars
- Automatic image sorting
- Facial recognition
- Medical imaging
- Agricultural and industrial monitoring