Artificial Superintelligence : AI Creates Another AI Using A Minion Approach

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ABSTRACT

Artificial Super Intelligence or ASI that is more potent and refined than human's intelligence. ASI is based on the ideas that machines can imitate the human mind, their way of working to the extent that they can even supersede them. As a first step, ASI aims to improve the cognitive abilities of the machines and to achieve this, the ASI will have to create many lesser robots/AI's designed to perform specific task for achieving unified consciousness or intelligence. In this paper, we implement a "Minion" scenario where a central AI controlling multiple lesser robots/AI's which have intelligence & consciousness of their own and we have taken Self-Driving Car as "Artificially" created intelligent/conscious object without any "living" properties. We have implemented Obstacle Detection(deep learning), Object Prediction(Kalman Filter) and a Central AI controlling a Minion(lesser & alien AI/Robot) which has intelligence of its own for a Self-Driving Car where it would have a variety of sensory inputs(environment perception) and be aware of its surroundings. The test results are encouraging and self-driving car is therefore shown "Unified Intelligence(Consciousness as well)" of the given order since it has obeyed by controlling various lesser robots designed to perform specified tasks.

INTRODUCTION

"**Superintelligence**" refers to the idea that steady advances in artificial intelligence, or machine (computer) intelligence, might one day result in creating a machine vastly superior to humans in reasoning and decision-making abilities.

Artificial Super Intelligence or ASI that has the capability to perform the tasks that are impossible for the human mind to think or do. It is that aspect of intelligence that is more potent and refined than a human's intelligence. Superintelligence is capable of outperforming human intelligence; it is extremely powerful in doing that. The human brain is made of neurons and is limited to some billion neurons. Superintelligence, therefore challenges this trait, which knows no limit.

The road to endless possibilities of Artificial Super Intelligence is paved by the ideas that machines can imitate the human mind, their way of working to the extent that shortly they can even supersede them. Under these circumstances, it is inevitable that ASI will be much better in concluding tasks that humankind would fail to achieve, and will function in better ways compared to the human.
In its first step, Artificial Super Intelligence aims to improve the cognitive abilities of the machine. In the future, the ASI will become more conscious, self-sustainable, and self-learning, developing, and improving constantly.

Artificial Intelligence is a term out of Informatics or Computer Science. "Artificial" fixes a created object by Human Being without any "living" properties. True" Artificial intelligence would indeed be intelligent, and possibly conscious as well. It would have to have a variety of sensory inputs and be aware of it's environment. Machines that are conscious will also be possible to build, in all likelihood.

Definition of **Minion** 1 : a servile dependent, follower, or underling. He's one of the boss's **minions**. 2 : one highly favored : idol his great charity to the poor renders him the **minion** of the people. 3 : a subordinate or petty official government **minions**.

METHODOLOGY

An AI could create another AI, if it needs one of the following:

1. A minion.
2. A companion or a "coworker"
3. A successor.

A high level artificial intelligence, even if it has extensible architecture that allows it to "grow" or increase its computational abilities will still be subject to law of physics. At one point AI would suffer from limitations on the speed of information transfer. For example, if an AI has a noble goal of colonizing the solar system, it will be unable to extend its consciousness to other planets as communication between planets takes time. So, ai will end up being split into multiple more or less independent entities which only communicate occasionally with huge delay. While an AI on earth could attempt to communicate with remote robot near Jupiter and control it directly, it would be much more reasonable to grant the remote robot some intelligence of its own, so the central AI wouldn't need to be bothered with mundane details, and at the same time the robot would be instantly able to react to situation. That covers "Minion" scenario. Basically, instead of being a unified consciousness or intelligence, an AI in this scenario works as a Queen of a hive, with multiple lesser robots/AI's designed to perform specific task.

A “companion” or “coworker” scenario is similar, only this time AI instead of a “lesser” machine would be creating its equal. For example, sending a probe with the new AI (along with nanomachine fabricator) onto another planet, and then establishing a contact with it remotely so that they think and make decisions as one.

As for successor, an AI may be unable to upgrade itself while remaining active. In this scenario it'll have to create a new AI (a more powerful one), boot it up, ensure it functions as expected, then grant the successor access to memory banks and shutdown itself. Basically, an equivalent of CPU/motherboard upgrade on modern computer. You can't exactly swap CPU while the system is still running.

A **self-driving car**, also known as a **robot car**, a**utonomous car**, or **driverless car**, is a vehicle that is capable of sensing its environment and moving with little or no human input. Autonomous cars combine a variety of sensors to perceive their surroundings, such as radar, Lidar, sonar, GPS, odometry and inertial measurement units. Advanced control systems interpret sensory information to identify appropriate navigation paths, as well as obstacles .

A car capable of autonomous driving should be able to drive itself without any human input. To achieve this, the autonomous car needs to sense its environment, navigate and react without human interaction. A wide range of sensors, such as LIDAR, RADAR, GPS, wheel odometry sensors and cameras are used by self-driving cars to perceive their surroundings. In addition, the autonomous car must have a control system that is able to understand the data received from the sensors and make a difference between traffic signs, obstacles, pedestrian and other expected and unexpected things on the road .

For a machine to be called a robot, it should satisfy at least three important capabilities: to be able to sense, plan, and act. Self-driving cars are essentially robot cars that can make decisions about how to get from point A to point B. The passenger only needs to specify the destination, and the autonomous car should be able to take him or her there safely.

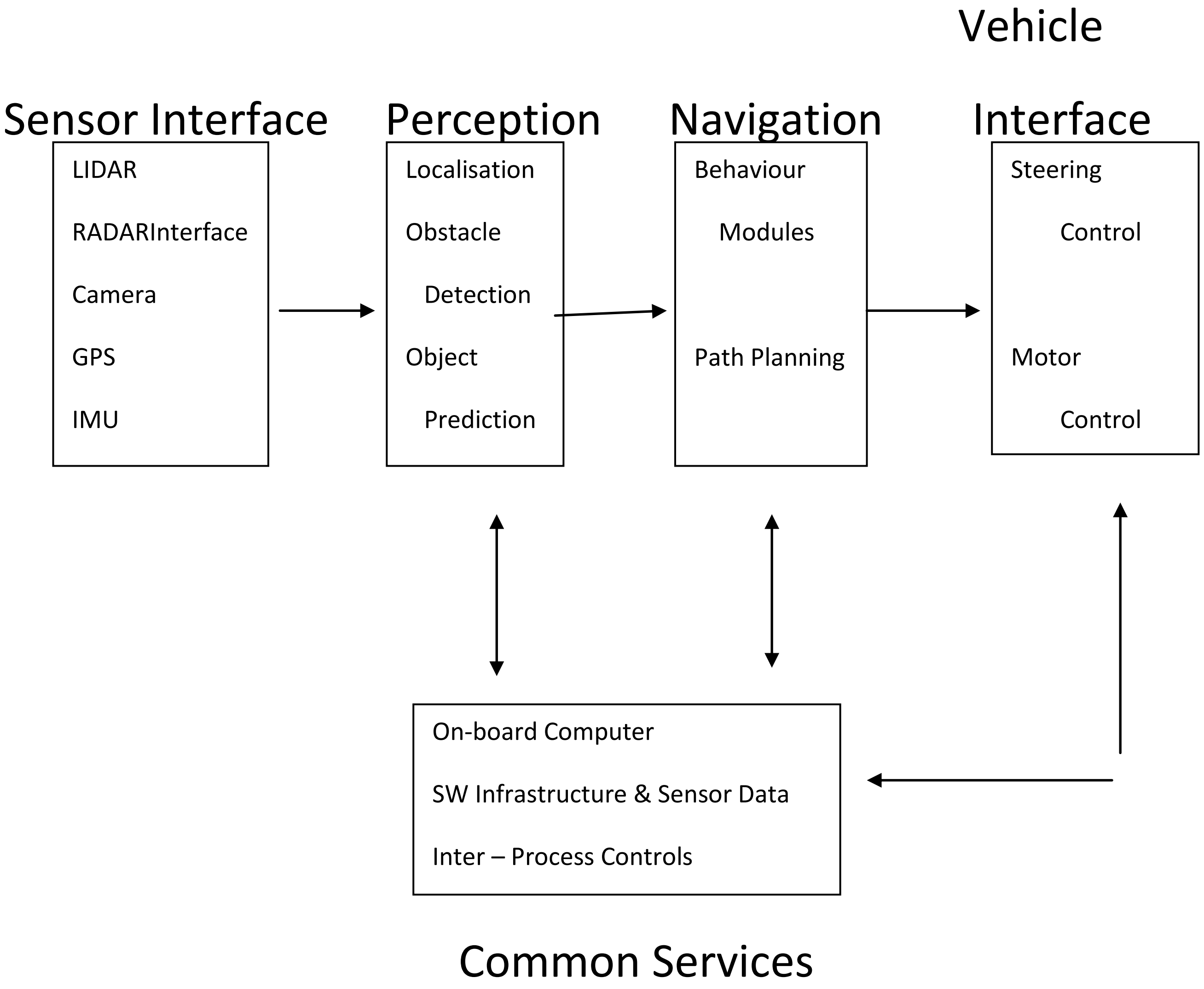


Figure 1 Illustrates the SW block diagram of the standard self-driving car.

Each block seen in Figure 1 can interact with other blocks using inter-process communication (IPC) and identified essential blocks for the SW block diagram of a typical self-driving car.

Perception modules. These modules process perception data from sensors such as LIDAR, RADAR and cameras, then segment the processed data to locate different objects that are staying still or moving.

Environment perception

Environment perception is the key module of a self-driving car. To provide necessary information for a car’s control decision, the car is required to independently perceive surrounding environment. The major methods of environment perception include laser navigation, visual navigation and radar navigation.

During environment perception, multi-sensors are deployed to sense the comprehensive information from the environment, which are then fused to perceive the environment. Among the sensors, the laser sensor is utilized for bridging between the real world and data world, radar sensor is used for distance perception and visual sensor is for traffic sign recognition. The self-driving car fuses data from laser sensors, radar sensors and visual sensors, and generates the surrounding environment perception, such as road edge stone, obstacles, road marking and so on.

By measuring the reflection time, reflection signal strength and the data of target point can be generated, then the testing object information, such as location (distance and angle), shape (size) and state (velocity and attitude) can be calculated out.

Synergistic Combining of Sensors

All the data gathered by these sensors is collated and interpreted together by the car’s CPU or in built software system to create a safe driving experience.

Programmed to Interpret Common Road Signs

The software has been programmed to rightly interpret common road behavior and motorist signs. For example, if a cyclist gestures that he intends to make a maneuver, the driverless car interprets it correctly and slows down to allow the motorist to turn. Predetermined shape and motion descriptors are programmed into the system to help the car make intelligent decisions. For instance, if the car detects a 2 wheel object and determines the speed of the object as 10mph rather than 50 mph, the car instantly interprets that this vehicle is a bicycle and not a motorbike and behaves accordingly. Several such programs fed into the car’s central processing unit will work simultaneously, helping the car make safe and intelligent decisions on busy roads.

Object detection is a computer technology related to computer vision and image processing that detects and defines objects such as humans, buildings and cars from digital images and videos. This technology has the power to classify just one or several objects within a digital image at once

Object detection is simply about identifying and locating all known **objects** in a scene. **Object tracking** is about locking onto a particular moving object(s) in real-time. **Objects** can be tracked based solely on motion features without knowing the actual objects being tracked.

KALMAN FILTER allows us to model tracking based on position and velocity of an object and predict where it is to be. **Kalman filtering** (KF) is widely used to **track** moving **objects**, with which we can estimate the velocity and even acceleration of an **object** with the measurement of its locations. However, the accuracy of KF is dependent on the assumption of linear **motion** for any **object** to be tracked.

Mathematical Formulation of Kalman Filter

The Kalman filter addresses the problem of trying to estimate the state $n\ x \in \Re^n$ of a discrete-time controlled process that is governed by the linear stochastic difference equation

$x_k = Ax_{k-1} + Bu_k + w_{k-1}$

with a measurement $y \in \Re^m$ that is

$y_{k =} Hx_k + v_k$

The random variables w_k and v_k represent the process and measurement noise respectively. They are assumed to be independent of each other and with normal probability distributions

$p(w) \approx N(0, Q)$

$p(v) \approx N(0, R)$

In practice, the process noise covariance Q and measurement noise R covariance matrices might change with each time step or measurement, however here we assume they are constant. The $n \times n$ matrix A relates the state at the previous time step to the state at the current step, in the absence of either a driving function or process noise. The $n \times 1$ matrix B relates the optional control input $u \in \Re^{l}$ to the state x. The $m \times n$ matrix H in the measurement equation relates the state to the measurement y_k .

The methodology essentially consists of the following :-

1. Object Detection Using Deep Learning
2. Object Tracking Using Kalman Filter
3. A Central AI Controlling A Minion; the resulting unified consciousness or intelligence formed by alien robots/AI’s.

ARCHITECTURE

Object Detection(Deep Learning)

Object recognition is a general term to describe a collection of related computer vision tasks that involve identifying objects in digital photographs.

Image classification involves predicting the class of one object in an image. *Object localization* refers to identifying the location of one or more objects in an image and drawing abounding box around their extent. *Object detection* combines these two tasks and localizes and classifies one or more objects in an image.

Object Detection: Locate the presence of objects with a bounding box and types or classes of the located objects in an image.

- *Input*: An image with one or more objects, such as a photograph.
- *Output*: One or more bounding boxes (e.g. defined by a point, width, and height), and a class label for each bounding box.

Let’s start with the simplest deep learning approach, and a widely used one, for detecting objects in images – Convolutional Neural Networks or CNNs. Convolutional neural networks have been one of the most influential innovations in the field of computer vision. These neural networks have proven to be successful in many different real-life applications, like: Image classification, object detection, segmentation, face recognition and Self-driving cars that leverage CNN based vision systems.

We pass an image to an object detection network - CNN, and it is then sent through various convolutions and pooling layers, to classify into various classes. Finally, we get the output in the form of the object's class.

When performing object detection, given an input image, we wish to obtain :

- A **list of bounding boxes**, or the *(x, y)*-coordinates for each object in an image
- The **class label** associated with each bounding box
- The **probability/confidence score** associated with each bounding box and class label

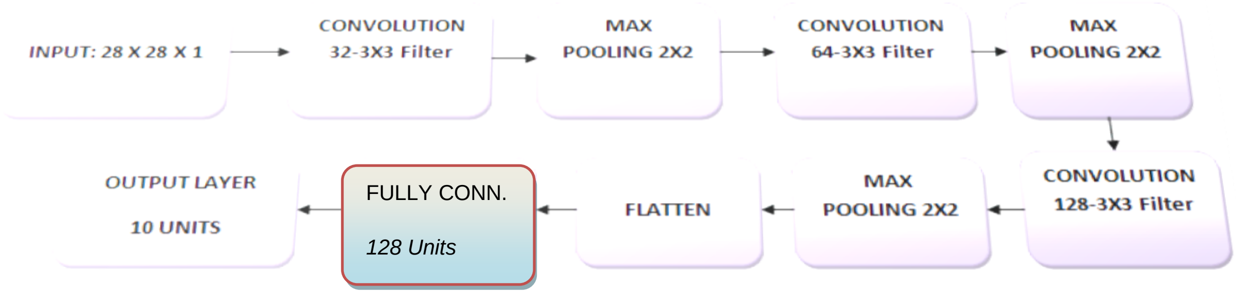
Therefore, object detection allows us to:

- *Present one image to the network*
- And *obtain multiple bounding boxes and class labels out*

We run the code that runs the inference for a single image, where it detects the objects, make boxes and provide the class and the class score of that particular object.

Our Final loop, which will call all the functions defined and will run the inference on all the input images one by one, which will provide us the output of images in which objects are detected with labels and the percentage/score of that object being similar to the training data.

The proposed CNN model comprising of different layers is as below:



We implement these deep, feed-forward artificial neural networks by overcoming overfitting with the regularization technique called “dropout”.

We have used the MNIST dataset for training and testing the image processing. The **MNIST database** (Modified National Institute of Standards and Technology database) is a large database of handwritten digits that is commonly used for training various image processing systems. The MNIST database contains 60,000 training images and 10,000 testing images. To load the data, we first need to download the data from the link and then structure the data in a particular folder format to be able to work with it.

From the above, we can see that the training data has a shape of 60000 x 784: there are 60,000 training samples each of 784-dimensional vector. Similarly, the test data has a shape of 10000 x 784, since there are 10,000 testing samples.

The 784 dimensional vector is nothing but a 28 x 28 dimensional matrix. That's why we will be reshaping each training and testing sample from a 784 dimensional vector to a 28 x 28 x 1 dimensional matrix in order to feed the samples in to the CNN model.

As a first step, we convert each 28 x 28 image of the train and test set into a matrix of size 28 x 28 x 1 which is then fed into the network.

The Deep Artificial Neural Network

We used three convolutional layers:

- The first layer will have 32-3 x 3 filters,
- The second layer will have 64-3 x 3 filters and
- The third layer will have 128-3 x 3 filters.

In addition, there are three max-pooling layers each of size 2 x 2.
We used a RELU as our activation function which simply takes the output of max_pool and applies RELU.

Also, we used Flattening layer and created a Fully Connected layer with 128 Neurons.

We added Dropout into the network to overcome the problem of overfitting to some extent and also to improve the training and validation accuracy.

Object Tracking(Kalman Filter)

Imagine about a self-driving car and we are trying to localize its position in an environment. The sensors of the car can detect cars, pedestrians, and cyclists. Knowing the location of these objects can help the car make judgments, preventing collisions. But on top of knowing the location of the objects, the car needs to predict their future locations so that it can plan what to do ahead of time. For example, if it were to detect a child running towards the road, it should expect the child not to stop. The Kalman filter can help with this problem, as it is used to assist in tracking and estimation of the state of a system.

The self-driving car has sensors that determines the position of objects, as well as a model that predicts their future positions. **Kalman filtering** is used for many applications including **filtering** noisy signals, generating non-observable states, and predicting future states. An example application would be providing accurate, continuously updated information about the position and velocity of an object given only a sequence of observations about its position. The Kalman filter exploits the dynamics of the target, which govern its time evolution, to remove the effects of the noise and get a good estimate of the location of the target at the present time (filtering), at a future time (prediction), or at a time in the past (interpolation or smoothing). **Kalman filters** produce the optimal estimate for a linear system. Also, the Kalman Filter enhances the accuracy of tracking compared to the static least square based estimation.

A Kalman Filtering is carried out in two steps: Prediction and Update.

The Kalman filter process has two steps: the prediction step, where the next state of the system is predicted given the previous measurements, and the update step, where the current state of the system is estimated given the measurement at that time step. The steps translate to equations as follows :

- Prediction

$\ddot{X}_k = A_{k-1} - X_{k-1} + B_k U_k$

$\ddot{P}_k = A_{k-1} P_{k-1} A^T_{k-1} + Q_{k-1}$

- Update

$V_k = Y_k - H_k \ddot{X}_k$

$S_k = H_k \ddot{P}_k H^T{}_k + R_k$

$K_k = \ddot{P}_k H^T{}_k S^{-1}{}_k$

$X_k = \ddot{X}_k + K_k V_k$

$P_k = \ddot{P}_k - K_k S_k K^T{}_k$

Where

- $\ddot{X}_k$ and $\ddot{P}_k$ are the predicted mean and covariance of the state, respectively, on the time step k before seeing the measurement.

- X_k and P_k are the estimated mean and covariance of the state, respectively, on time step k after seeing the measurement.

- Y_k is mean of the measurement on time step k .

- V_k is the innovation or the measurement residual on time step k .

- S_k is the measurement prediction covariance on the time step k .

- K_k is the filter gain, which tells how much the predictions should be corrected on time step k .

X : The mean state estimate of the previous step (k −1).

P : The state covariance of previous step (k −1).

A : The transition n x n matrix.

Q : The process noise covariance matrix.

B : The input effect matrix.

U : The control input.

At the time step k , the update step computes the posterior mean X and covariance P of the system state given a new measurement Y . The function therefore performs the update of X and P giving the predicted X and P matrices, the measurement vector Y , the measurement matrix H and the measurement covariance matrix R .

The Kalman Filter for object tracking has been implemented with Python.

A Central AI Controlling A Minion

The detection and tracking of objects around an autonomous vehicle is essential for operating safely. All objects are classified as moving or stationary as well as by type (e.g. vehicle, pedestrian, or other).The proposed approach uses state of the art deep-learning network combined with data from a laser scanner to detect and classify the objects. And estimate the position of objects around the car and this information fused with measurements from a GPS using Kalman Filter. The resultant solution aids in the localization of the car itself and the objects within its environment so that it can safely navigate the roads autonomously.

The image obtained from the camera is used to detect the object and classify them. The objects in the image are detected using Convolutional Neural Networks (CNN). Once objects are detected they are stored in a database. With object detection in the image complete, the data from the laser scanner is projected onto the image. This allows for the measurement of the distance and direction of detected objects from the Robot Car. This information along with the state of Robot Car is combined with a Kalman Filter (KF). Both the state of the objects and the Robot Car are updated using KF allowing for a combined localization and tracking of objects in the environment.

Tracking of moving objects for autonomous vehicle is important and is of great importance for the safety and collision avoidance. The data from cameras, LiDAR and GPS is fused to achieve this goal. The paper uses the CNN algorithm to detect and classify the objects around the vehicle. This information is then fused with the information from the LiDAR and GPS to successfully navigate the Robot Car with tracking and detection of objects.

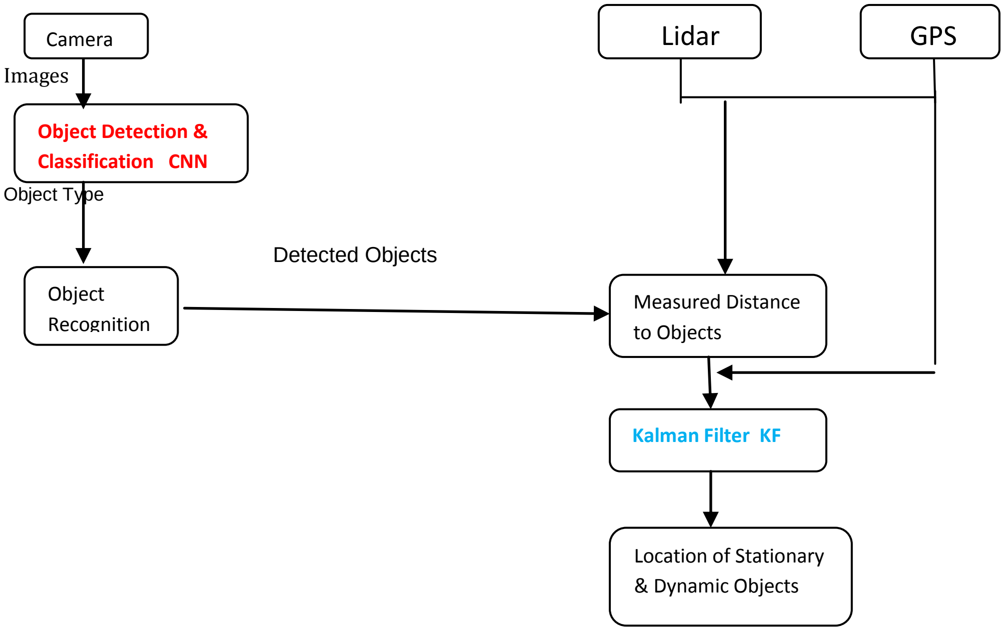


Figure 2 : Block Diagram of Proposed Minion

Figure 2 shows the block diagram of the system that of detecting objects around the Robot Car and track them

An AI will split into multiple more or less independent entities which only communicate when needed with a high level artificial intelligence agent i.e. Central AI. This covers “Minion” scenario where an AI works as a sovereign ruler of a flock with multiple lesser robots/’AIs’ designed to perform specific task. The objects in the image are detected using Convolutional Neural Networks (CNN) with object detection in the image complete, the data from the laser scanner is projected onto the image. This allows for the measurement of the distance and direction of detected objects from the Self-Driving Car. The information about detected objects and from other sensors is fused together using Kalman Filter (KF) for tracking of the objects around the autonomous car. Kalman Filtering is used for providing accurate, continuously updated information about the position and velocity of an object including predicting future locations to avoid collisions for autonomous car.

It may be seen from the above figure that high level artificial intelligence has detected and classified objects around autonomous car, and this information along with current state of the car is combined with Kalman Filter (KF) which is a lesser robot and designed to perform specific task of its own. Both the state of the objects and the Autonomous Car are updated using Kalman Filter allowing for a combined localization and tracking of objects in the environment for avoiding collision.

TEST RESULTS

Object detection is about identifying objects in an image and the test results show good accuracy between training and validation data. However the CNN algorithm needs a lot of regions to predict accurately and hence high computation time.

The Kalman filter is a uni-modal, recursive estimator. Only the estimated state from the previous time step and current measurement is required to make a prediction for the current state. The Kalman Gain is calculated along with the observed data and the process covariance is also updated based on the kalman gain. These updates are used for the next round of predictions. The observations are compared to the prediction and the test results show close proximity between measured and estimated trajectory/values which is a good indication that the system is performing well, while tracking the objects around itself.

CONCLUSION

Artificial Super Intelligence(ASI) is based on idea that machines not only imitate the human mind but can even supersede human's intelligence. In order to achieve this, the ASI will have to be more conscious by improving creative abilities of the artificial machines. In this paper, we have taken self-driving car as "Artificially" created intelligent/conscious object and implemented Obstacle Detection(deep learning), Object Prediction(Kalman Filter) and a Central AI controlling multiple lesser AI's/Robots where it would have variety of sensory inputs and be aware of its environment. The test results show that it is possible to build artificial machines that have unified consciousness and intelligence by controlling various lesser robots/AI's (alien Robots/AI's) which are designed to perform particular task.

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