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DEVELOPING A HUMAN

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Abstract: As the year passes by the computer has started becoming more and more powerful. The scientists in the whole world are trying to develop machines and intelligent robots that can smell, touch, sense and interact with humans. Capabilities of a machine are already more stronger and flexible than our sensory organs and muscles allow us to be. This research paper studies the progress done till date in bringing the humans and machine close.

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It took humans race a thousand years to learn language whereas computer has taken 50 so far. There are similarities between humans and machines in speech processing but the computer works only in sequential order, while the brain processes cross linked information all the time. An extremely complicated system has to piece together words and sentences from the recorded sounds of speech, and then analyze them to recognize meaning.

In order to recognize language correctly, sounds are first analyzed and converted into digital signals. The system needs to filter out background noise to process only the voice, and also has to identify individual voices, as a blend of all sounds together would not result in a single understandable word. The human brain also converts sound waves into electric signal, but it can grasp and follow individual voices when several people are talking at the same time. Every speech signal is dealt in the same way. Both computers as well as humans generate a frequency spectrum so as to process the filtered speech signal. Human process is carried out in the ear, but the machine uses Quick Fourier Transformation for the same. The frequencies are analyzed again by the Hidden markov model that checks frequencies in a short period of time so as to identify individual phonemes and combine them meaningfully into words and sentences. The machine falls back on a database of grammatical models and example sentences to differentiate between similar sounding words for instance “see” and “sea” or “weather” and “whether”. Under optimal conditions, the computer can recognize almost 98% of the language. Software has difficulty recognizing dialects and colloquial language.

Many problems related to the mechanical understanding of the language or language recognition can be solved by using a more comprehensive database that saves particular sound frequencies. The machine face a bigger challenge while understanding the meaning of what has been said is concerned: how should a language is interpreted? The computer is not conscious, it follows rules. More complex rules give it a better understanding of the language. With regard to factual knowledge the computer is far superior to humans, as it accesses 100GB of encyclopedia and dictionary entries amongst other things. Using mechanical learning, the computer can store new information link it with what it already knows. Still, it does not do anything other than recalling facts and finding links between them. On the other hand, humans do not pause for ambiguity; the brain simply comes for a solution. Association, events, personal judgments and the environment are taken into consideration. The human brain notices its environment in a selective and deliberate fashion, whereas the computer saves all possible details.

A machine can't cope with language recognition as well as interpretation on the level that humans do. Apart from just processing language, many other factors play a role in the interpretation of its intent. Human brains consider several contexts and can understand the intent of the words with reference to situations, as the brain is in continuous contact with its surroundings. The only advantage of the computer is its collected, classified and can be invoked anytime-even the most insignificant side note. Humans retain only a fraction of this information.

EYE

The Hubble telescope has captured images of galaxies about 13.2 billion light-years away. The world's most powerful electron microscope, TEAM 0.5 in Berkeley, California, can observe atoms as small as 0.1 Nanometers across. These are the extremes within which cameras can function. The furthest galaxy that can be seen by man is only 2.3 light years away; the smallest discernible object measures some 1000 nanometers across. Those are the limits of the human eye. Machines can store much more detail than the human eye, and every bit of captured information can be stored for future retrieval. Machine can see much more detail than the human eye, and every bit of the captured information can be stored for future retrieval. Yet scientists have been working for years to better emulate human sight, because humans still interpret and extrapolate image information better-even bad image quality can represent something beautiful.

The human eye can concentrate on an object and define its sharpness, react to the changes in the brightness in a split-- second and detect the finest of contrast differences. Still, the human sees only a fraction of what the camera immortalizes in a photo, and even that fraction is anything but perfect. The human eye suffers from chromatic aberration, and is further handicapped with a blind spot. In order to minimize errors, most photographic equipment is made up of many converging and diverging lenses of different types, which break up light in such a way that captured image look as clean as possible. Eye also perceives colors only in the center of the field vision, since the rods responsible for this are concentrated here in the retina. On the other hand the details and colors that a camera saves is decided by a sensor. The more pixels a camera can capture the larger the number of picture dots that the photographer can print on paper.

The eye is clearly inferior- yet humans do not see these shortcomings. The brain simply compensates for incomplete information by inventing a good image. That is why the efforts are not concerned with imitating the eye for its recording abilities, but the entire optical neural system for its manner of processing. Machines can capture perfect images, but do not know what is of interest in them. Just like the eye, the camera has a wide range of vision with low resolution. Only when it sees something interesting does it concentrate on it and reproduce it in the best quality. The result in the "saliency map" in which bright areas signify the importance and dark areas signify the unimportant regions of the scene. However, the camera does not recognize objects on its own-further processing can be done by other robots.

Intelligent sight is has interesting applications beyond robots and industrial machines. For e.g., in vehicles, cameras assist the human eye by controlling the headlights, inspecting lanes and recognizing road signs.

Cameras are still a limited solution. They do not measure up to the visual performance of humans. The brain do the actual seeing, and the biggest challenge is to teach the camera to reliably identify the parts of a scene that are relevant to a task.

EAR

Human ear is the most perceptive sense organ, and locates sounds quite accurately too. The human ear is highly complex and incredibly accurate measuring instrument. With around 15,500 sensory cells per year, man can differentiate about 4,00,000 sounds- a trained ear can even determine the exact pitch of a tone. And still man hears much less than artificial systems do. For instance, man can listen to what songs only with the help of special equipment, because they "sing" at frequencies of up to 280 Kilohertz. The human ear can hear only between 16 hertz and maximum 20 kilohertz-but this does not mean that the machines hear better. The ear can concentrate on specific sounds and it can even locate a glass bottle shattering on the floor at distances of up to 10 meters.

Whether the voice that we hear is coming from the front, back or side, our ears clearly sense the direction and even the distance. Two essential abilities of binaural hearing are very important for that, and researchers have been trying to use them in machines. The ear recognizes difference in time and sound pressure between the two ears. These are created by the physical structure of our skulls, which form natural obstacles along which sound is reflected. Our ears can recognize the time difference accurately to within 10 microseconds.

Scientists purposefully use this quality of human ears for artificial systems, which is why there are machines for experimental purposes in the shape of a human head, with ear-shaped structures around the microphones in order to capture stereoscopic impressions in most natural way possible. Stereoscopic orientation works properly for machines as long as they are in a test environment prepared especially for the purpose. As soon as they find themselves in everyday situations, however, they are defeated. The essential difference from a human being is the lack of intelligence. A well-known scenario would be a cocktail party: when many people are talking in a room and music is also being played, one can still follow the individual speakers. Machines are overwhelmed in such situations and cannot filter out the irrelevant frequencies. For them, only a non-identifiable noise exists. A robot must know which specific sound source is significant in order to concentrate on it.

Scientists use with various tricks depending on the potential application of artificial hearing, in order to give machines better intelligence. The industry benefits immensely from such solutions and many systems are already in the market. Technology from mobile phones, hands free car kits and even conference room equipment is used. The ideal solution would be to filter out specific frequencies, but all the sounds of a car engine, for example, cannot be eliminated this way, because it would affect the entire frequency band. One must carry the entire frequency band. One must carry out a direction analysis.

Everyday noise is still a problem, and artificial haring cannot adjust to every possible situation. Even if a machine does not have any trouble in locating sound in an echo-free room, it would be stretched to its limits in a sound space, such as an empty hall. It would need to be manually optimized for every individual situation.

It is easier for simpler systems such as speech recognition programs- the microphone is directly held to the mouth. The system recognizes what is spoken the loudest and thus has a completely different problem; it must recognize that it is concerned with language input, and interpret similar sounding words and inflections. It will take some time for robots to orient themselves in day-to-day life with the help of artificial ears. Any successful system will be able to process all kinds of input signals in parallel, i.e. they will need to be able to link motor-driven, auditory and visual information to pinpoint and focus on specific sound sources.

NOSE

The air on a summer morning, flowering meadows, the seats of a new car: such smells remain in or memories and stimulate or repulse us. For machines, smells are nothing but the characteristics of molecules that can be analyzed and evaluated. That the human reacts so emotionally to smells is surprising, since he does not even smell all that much. Artificial noses are comparatively primitive, with up to 32 sensors, the artificial olfactory cells. These sensors are precise, but need to be re-calibrated for every smell. The machine can access only what has already been stored in its database.

We do not have a universal solution, and scientists are working with various systems developed for various tasks. But an e-nose always contains one element: a sensor that catches odor molecules and converts them into electric signals. The technology is very different from a natural nose. While each human olfactory cell only detects a specific type of molecules, the sensor records several different ones. To make a sensor react to individual scents, the scientists use various materials like tin oxide or zinc oxide to detect complete smell patterns like some type of wine. The sensor alone cannot differentiate a fine wine from lead-free gas. It only records the molecules, but does not evaluate them; it represents the chemical detection level. A machine just like humans can detect and qualitatively evaluate a smell only by training. The sensors produce a signal, but to know exactly what they detect, a pattern recognition matrix must be established.

Electronic noses are already becoming standard equipment in some areas. For instances, such a sensor in your car can detect when you are driving in a tunnel, and switch from sucking in fresh air to recirculate air with in the car. In the future , devices will also monitor catalytic converts that burn hazardous carbon monoxide, which Is odorless to human and no matter how high concentration. Electronic sensors, on the other hand, can find even mall concentration and alert us to defective systems immediately.

The electronic nose is still at the beginning of its development. Its biggest problem: it takes in too many varied odor molecules, and is not selective enough. A solution could be to develop new sensor materials, which have finer control than today's metallic oxide semiconductors. Moreover, researchers are designing small transportable devices that can be integrated into mobile phones, so a caller could potentially test the alcohol level of the person he is talking to. Such a nose will soon be able to tell you that exact ingredients of a wine , but a machine will still not be able to say for certain how good it is.

TONGUE

Taste is a survival mechanism, alerting us to potential harmful or potential nutritious substances. Approximate 10,000 taste buds reside on the tongue. These taste buds fall into 5 basic categories: sour, bitter, salt, sweet and unani with grouped receptors dissipalated over the surface of the tongue for each stimulus.

Physiological factors such as temperature and texture clearly affect the perception of taste. Several industries-chemical, pharmaceutical, agricultural & food have interest in developing and efficient, low cost instrument to fast analyze and classify complex chemical solutions. There is a vast range of pplications for the e-tongue, for instance: continuous control on product quality , detection of pollutants in water detection of analysis in low concentration solutions difficult to be distinguished by humans being or even impossible.

The e-tongue system is composed by hardware and software components. The hardware is used for the capacity measurements of sensorial units of and the software controls the data acquisition, perform the calculations and analyze the electric signals. The taste of cyanide can also be known by e-tongue which is impossible for humans.

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