Individual assignment 1

Originally Alan Turing postulated in his 1950 paper, that a machine that could interaction with human without human knowing that it is a machine could be identify as an intelligent machine and can win the imitation game. In 1956, the American computer scientist John McCarthy organized the first Dartmouth Conference, at which the term Artificial Intelligence was first used. Researcher Allen Newell and Herbert Simon were instrumental in promoting AI as a field of computer science that later would revolutionize the world of Technology. [1]

In 1956, the Dartmouth Research Project on AI defined AI as the problem of *making a machine behave in ways that would be called intelligent if a human were so behaving*. [2]

In 1968 in his thesis, Marvin Minsky, a pioneering mathematician, cognitive scientist, and computer engineer, and a father of the field of artificial intelligence considered AI as *the science of making machines do things that would require intelligence if done by men*. [3]

The theory of multiple intelligences differentiates intelligence into specific 'modalities', rather than seeing intelligence as dominated by a single general ability. Howard Gardner proposed this model in his 1983 book Frames of Mind: The Theory of Multiple Intelligences. According to Gardner, an intelligence must fulfil eight criteria: musical-rhythmic, visual-spatial, verbal-linguistic, logical-mathematical, bodily-kinaesthetic, interpersonal, intrapersonal, and naturalistic. He later suggested that existential and moral intelligence may also be worthy of inclusion. [4]

I would define AI as a combination of given three definitions above, as Howard Gardner proposed that an AI should perform in all eight criteria in independently that imply definition of J. McCarthy and Minskys definition that an artificial agent display intelligence that are distinctly human and that beat an imitation game or pass the turing-test for an AI, where a human that cannot distinguish that the intelligent agent is human or a non-human being.

Definition of AI

A machine that can mimic human attribute in completing tasks that are undistinguishable from a human.

This definition characterizes machines abilities to adopt human behaviours which would server purpose in our development. That is there would be no desire to build a machine that cannot adopt human behaviours. An ultimate goal for an AI would be achieve human-level intelligent, which require ultimately that it can express all eight criteria of H. Gardner and aware of its existence and reinforce knowledge.

Amazon is an online retail giant offers both consumer and business-oriented AI products and services and many of its professional AI services are built on consumer products. Amazon Echo brings artificial intelligence into the home through the intelligent voice server, Alexa. For AWS, the company has three primary services: Lex, a business version of Alexa, Polly, which turns text to speech, and Recognition, an image recognition service. [5]

A boys best Friend by Issac Assimov, is a science fiction short story published in 1975. This story is set far in the future when habitation of the Moon has already taken place. Jimmy Anderson is a Moon-born ten-year-old, and he owns a robotic dog named Robutt, whom he comes to love. He can go on the moon freely and securely as he is moon born and has Robutt with him. However, his parents want him to have a real dog, a Scottish Terrier. Since Moon-borns cannot visit Earth, his parents bring the dog to the Moon. But since the relationship between Jimmy and Robutt is so close, Jimmy decides not to have the 'living' dog and keep the 'fake' dog Robutt instead. [6]

The word Robot is not an original English word, it was first coined by a brilliant Czech playwright, novelist and journalist named Karel Čapek (1880-1938) who introduced it in his 1920 hit play, *R.U.R.*, or *Rossum's Universal Robots*. [7] *Robot* is originally from an old Church Slavonic word, *robota*, for "servitude," "forced labor" or "drudgery." The word, which also has cognates in German, Russian, Polish and Czech, was a product of the central European system of serfdom by which a tenant's rent was paid for in forced labor or service.

R.U.R. takes inspiration from other known literary accounts of scientifically created like Mary Shelley's classic Frankenstein and the Yiddish-Czech legend The Golem. *R.U.R.*, or *Rossum's Universal Robots* about a company using latest technologies in biology, chemistry and physiology to mass produce workers who are non-human being as Karel described in the book entities "lack nothing but a soul". [7]

In the play the robots able to perform all the works that humans generally not preferred as a result the fictional robot-company is inundated with orders. In early drafts of his play, Čapek named these creatures *labori*, after the Latinat root for *labor*, but later suggested by his brother, Josef, Čapek he changed it *roboti*, or in English, *robots*. [7]

In the play's final act, the robots revolt against their human creators. After killing most of the humans living on the planet, the robots realize they need humans because none of them had the knowledge of manufacture more robots, a secret that they didn't possessed and died with the last human being. In the end, there is a *deus ex machina* moment, when two robots somehow acquire the human traits of love and compassion and go off into the sunset to make the world anew. [7]

A robot can be defined as a programmable, self-controlled device consisting of electronic, electrical, or mechanical units. More generally, it is a machine that functions in place of a living agent. [8]

In this definition a robot defined as a mechanical component that can operate in place of human agents and thus carry out functionalities that usually required human presents and eventually replace human workers.

Even though, definition do not specifies a given robot physical appearances or described with human's physical attributes but characterized as performed at same level as humans with higher

mechanical endurance in similar functional manner perhaps with different physical attributes. At the same time follows a given set of instructions without any form of external supervision and guidance.

A robot is an autonomous machine capable of sensing its environment, carrying out computations to make decisions, and performing actions in the real world. [9]

Above definition describes more of an autonomous unit more interactive with its environments. Like as it describes by the author, think of the Roomba robotic vacuum. It uses sensors to autonomously drive around a room, going around furniture and avoiding stairs.

it carries out computations to make sure it covers the entire room and deciding based on predefined logical-instruction sets if a spot needs a more thorough cleaning; and it performs an action by "sucking dirt," as roboticist Rodney Brooks, one of the Roomba creators, explains. [9]

Definition of Robot

A robot is a mechanically designed component to perform one or more tasks based on predefined instructions and perform repetitively without human supervision and guidance.

This definition suggests a Robot can perform given set of instruction and continuously perform assigned tasks without any human or other external supervision or guidance. A typical example of this would be industrial robot, generally heavy rigid devices limited to manufacturing. That has a routines and instructions given to it that focuses on one specific task involving such as assemble a car-door in a car manufacturing company or assembling any component of a vehicle, and its only goal is manufacture as much as possible.

Another advance semi-autonomic example that is going to imply involving cars is self-driving car in near future, likes of Tesla. That can read and adjust its driving patterns on the road and calculate its rout without any human interventions or supervision. Like Tesla vehicles today have this type self-driving routines but the requirements are human-driver should have its hands on the cars steering wheels at all time, but in next two or three as Tesla plans that would be obsolete.

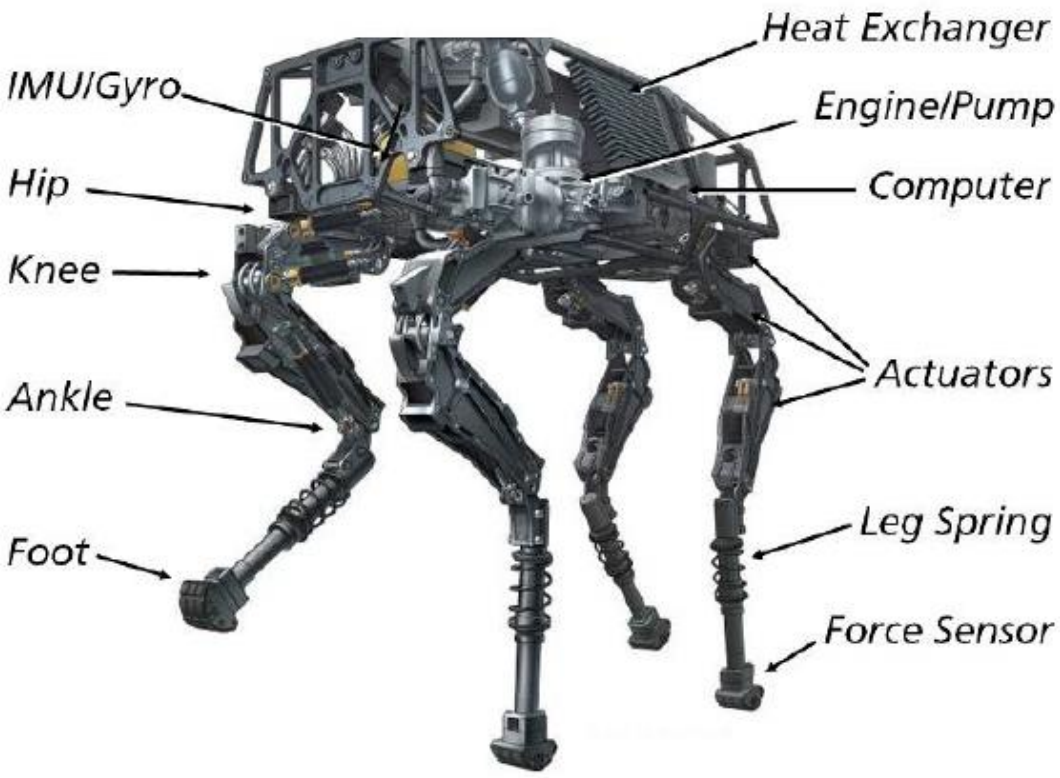
Relation and difference between AI and a Robot, as discussed above section an AI and Robot in general specified in different characterizations, like an AI expected to be self-learned and operate based on experiences, i.e. showcases human learning mechanisms that is believed to be a natural phenomenon. As H. Gardner's eight human attributes and all them leads to the term we human define ourselves dearly is "Creativity", that we human are uniquely creative and separate our self thus from rest of the animal kingdom.

The requirement for an AI to show this peculiarity is signs of intelligence, ergo mimicking human quality. This unique requirement does not automatically apply to any robots because we do not have similar expectation from an industrial robot as we do to an AI. We expect an industrial robot to perform a routine or a set of routines to do continuously perform over longer period of time. Then again we expect a self-driving car to have more human type of common-senses and travel from point a to b. So we can mount an AI on a robot and ask for to be more independent but technical distinctions between AI and Robot are lots.

This section was retrived from Bigdog article from Boston dynamic [10]

Boston Dynamics developed a new breed of rough-terrain robots that capture the mobility, autonomy and speed of living creatures. Such robots will travel in outdoor terrain that is too steep, rutted, rocky, wet, muddy, and snowy for conventional vehicles. They will travel in cities and homes, doing chores and providing care, where steps, stairways and household clutter limit the utility of wheeled vehicles. Robots meeting these goals will have terrain sensors, sophisticated computing and power systems, advanced actuators and dynamic controls.

BigDog is a legged robot is still under development at Boston Dynamics, with funding from DARPA. BigDog has onboard systems that provide power, actuation, sensing, controls and communications. The power supply is a water-cooled two-stroke internal combustion engine that delivers about 15 hp. The engine drives a hydraulic pump which delivers high-pressure hydraulic oil through a system of filters, manifolds, accumulators and other plumbing to the robot's leg actuators. The actuators are low-friction hydraulic cylinders regulated by two-stage aerospace-quality servovalves. Each actuator has sensors for joint position and force. Each leg has 4 hydraulic actuators that power the joints, as well as a 5th passive degree of freedom. A heat-exchanger mounted on BigDog's body cools the hydraulic oil and a radiator cools the engine for sustained operation. See Figure 1 for details



Figur-1 from Boston dynamics [10]

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BigDog has about 50 sensors. Inertial sensors measure the attitude and acceleration of the body, while joint sensors measure motion and force of the actuators working at the joints The onboard computer performs both low-level and highlevel control functions. BigDog has a variety of locomotion behaviors. It can stand up, squat down, walk with a crawling gait that lifts just one leg at a time, walk with a trotting gait that lifts diagonal legs in pairs. Travel speed for the crawl is about 0.2 m/s, for the trot is about 1.6 m/s (3.5 mph), for the running trot is about 2 m/s (4.4 mph) and BigDog briefly exceeded 3.1 m/s (7 mph) while bounding in the laboratory. BigDog weighs about 109 kg (240 lbs), is about 1 meter tall, 1.1 meters long, and 0.3 m wide.

BigDog is usually driven by a human operator who works through an operator control unit (OCU) that communicates with the robot via IP radios. The operator uses the OCU to provide high-level steering and speed input to guide the robot along its path and to control the speed of travel. The operator can also tell the robot to start or stop its engine, stand up, squat down, walk, trot, or jog. A visual display provides the

operator operational and engineering data. The operator only provides high-level input, leaving BigDog's onboard control system to operate the legs, provide stability on rough terrain, and reflex responses to external disturbances.

Universal Design (UD) is an approach to design that increases the potential for developing a better quality of life for a wide range of individuals. It is a design process that enables and empowers a diverse population by improving human performance, health and wellness, and social participation. [11]

It creates products, systems, and environments to be as usable as possible by as many people as possible regardless of age, ability or situation. Other terms for Universal Design used around the world include Design for All, Inclusive Design, and Barrier-Free Design. [11]

Defining inclusive with respect to UD, Inclusive design doesn't mean you're designing one thing for all people. You're designing a diversity of ways to participate so that everyone has a sense of belonging (Susan Goltsman [12]). Inclusive design should always start with a solid understanding of accessibility fundamentals. Accessibility criteria are the foundation of integrity for any inclusive solution.

Facial expressions can give us insight into a person's emotions, an AI that can understand people in the same way that humans do, based on an understanding of not only facial expressions, but the other channels people use to express emotions, including face, voice, and gestures. Only 7 percent of how people communicate their emotions is via words—the rest is non-verbal.

Human Perception AI will enable cars to optimize the ride based on who is in the vehicle, their mood, and how they are interacting with others in the vehicle. Tesla working on HCI system that based on human car interaction done through facial recognition. This would primarily guide the car to follow its human driver its facial and body-reactions. Tesla creating it background of drivers sleeping behind steering wheel while driving the car or instances of drunk driving, where vehicles self-driving mode automatically initialises takes over whenever car detects this pattern of behaviour through facial recognition.

Excluding pattern in AI based on faulty data, like an AI can take make a decision based on a person's ethnicity. In a fictive situation where a person with darker skin tone is a student at a school that uses facial recognition software. The school uses it to access the building and online homework assignments. In this hypothetical situation let's say creator of this software only used people with light-skinned tester to test the software and train its algorithm and initial-stage of software deployment only data this software had are based on light-skinned people. If your skin is darker, and the software has trouble recognizing you. Which automatically cause faulty in the data, such as sometimes you're late to class, or can't get your assignments on time. Your grades suffer. The result is discrimination based solely on skin colour. [13]

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