Summary:

The 21st century is the revolution of technology from many years we are using robots. I think the first robot was invented in 1954 however in the advancement of this decade now we are using some advanced robots some are simple classical robots & some companies are making advances like Samsung, Microsoft, etc. now from the selected Research paper they are taking quantum mechanisms and implement in robots. They are discussing the classical Braitenberg vehicles and various problems in them. Now they are using classical finite automata, Moore machines to improve the quality of Braitenberg vehicles. They are introducing intrinsic nature to it by using entanglement it stops motion without external signal. This technique leads him to design a quantum automated Braitenberg vehicle. They are incorporating the possibility of external control over its movement. After implementing the circuit in IBM Quantum Experience they got good and positive results. The idea of the development flexibility of manual external controls got a better result than classic robots using lesser numbers of Gates.

Motivation:

What was the reason to propose their method?

Robots are the dream of the upcoming world and major achievement of Science and Technology from the last half of the 20th and 21st century. As Technology Progress the dream of robots serving in defense, industries, and different other fields. Quantum computation is the powerful machine which solves complex problems then classic computer when we implement the quantum method in robots it makes the robots more intelligent and when we want to make robots size more minimum then its become quantum facts. The study of robots and the engineering behind them can give motivation for the development of powerful quantum computers.

How did previous work in the field influence and guide their research?

Motivated by the fact that it is so hard to perform a complex matrix on a classic computer after that in 1980, Paul Benioff first suggested the idea of quantum information the idea was furthered by Feynman where he reasoned about physical simulations on quantum computers. Scientists have taken inspiration from this and have been able to realize the potential that lies in the application of quantum phenomena in the field of robotics. It can be seen that quantum robots can more efficiently solve complex problems than classical computers. We can improve the setup further by using quantum sensors, and it can be made faster by using parallel computation and learning of quantum algorithms.

Method:

The techniques used by authors. What was done and how?

In that paper, they use the idea of classical Braitenberg vehicles and convert it into Quantum Braitenberg vehicles/robots. They use the Quantum mechanism in classical Braitenberg vehicles. Braitenberg shows a vehicular agent consisting of sensors and motors connected to wheels. The sensors measure some stimulus and based on some classical sequential logic, the motors may work in some configurations and may not work in others, thus depicting intelligent behavior.

Contribution

What is novel about the proposed technique?

in the proposed techniques they are taking a classical Braitenberg vehicle and put some quantum mechanics to design a new machine that works without any human assistant/agents.

Experiments/Analysis

How do the results compare with competing methods?

A Moore machine is finite automata machine where the output states are also considered in the input in the next iteration of the logic the outputs, however, depend only on the logic performed by the circuitry designed and not on the input states. Now a sample runs of such an automated robot. They assume a robot with two sensors S1 and S2 and two motors M1 and M2 connected to two wheels W1 and W2 respectively. We implement the Moore machine (denoted in subsequent discussion in this section as M) such that when $M = 1$, the motors are in movement and the robot moves forward, and when $M = 0$, the motors depending on the external light signals for their movement.

S1	S2	M	M1	M2	Movement
0	0	0	0	0	Nothing
0	0	1	1	1	Forward
0	1	0	0	1	Right
0	1	1	0	1	Right
1	0	0	1	0	Left
1	0	1	1	0	Left
1	1	0	1	1	Forward
1	1	1	0	0	Stops

If there are any shortcomings, how can they be explained?

The Computation of the used gates is so fast, thus it's required the signals to be inputted continuously without interrupting the shortcomings found when they implement physical the machine. If the sensor is open to the atmosphere then the light present in the atmosphere can't stimulate them because generating the frequency of light from the atmosphere is different.

Critical Review

How do you rate the work as a critique, does the work have any significance, if yes please explain?
I rate the work as a critique is 9/10. Because in daily life now we are seeing the Google cars which are driverless and other many robots which work without a human assistant. Which give us many benefits like human have many issues in life's and robots have nothing to do expect your work for which you programmed robot. Yes, this work has much interesting significance in the 21st century and upcoming times everything is going to be automated in Cambridge big tech giants are now using the automated machine to program majority are now using scripts.

Write about the soundness of the techniques used e.g. unreasonable assumptions, and limitations, etc.
There are some certain limitations like atmosphere light which is different frequency can interrupt the system. Without the need for external light intrinsic tendency to automatically stop.

Shortcomings

Any research questions raised or problems you find in the paper?
No, there is nothing like problems everything is working on experimental based and according to the paper, there is no issue in the experiment.

Future Work

Are there any possible extensions and improvements to the work?
Yes, there is much application where we can use quantum phenomena and make more advance robots which help us to solve complex issue also if they work harder and upgrade these applications then it can give this world more benefits.

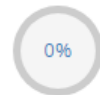**Have the authors proposed any future direction?**
Yes, according to the authors they are motivated to implement more tasks in this project and make him more advance that the public can also use this they are struggling to implements quantum phenomena in many robots or machines for human easiness.

NAME	ATIF JAN
SECTION	C
R.NO	178
SELECTED TASK	MOORE MACHINE
LECTURER	SAJID UMAIR

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