International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume 25 Issue 5 – APRIL 2018 (SPECIAL ISSUE).

COGNITIVE INDUSTRIAL LOAD CONTROL IN A VIRTUAL REALITY

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Abstract- **Virtual Reality (VR) is becoming the enabling technology for man-machine communications. Besides entertainment and architectural walkthroughs, VR can be used in industry for better design evaluations, concurrent engineering, etc. Medicine is one of the biggest beneficiaries with the development of surgery simulation. This is often used as a training aid and enables the surgeon to perform an operation on a 'virtual patient' or to see inside the human body. It is also used as a diagnostic tool in that it provides a more detail view of the human body compared to X-rays and scans. Another popular use of virtual reality is aviation: a three dimensional aircraft can be designed which allows the designer to test their prototype without having to have several versions – which are time consuming and costly. It is cheaper and easier to make changes to the simulation rather than having to design and build a new aircraft. In this project we introduce Smart Industrial Load Control in a Virtual Reality is presented. Smart Industry means controlling each and every Load and machines automatically without human intervention. Here we are using a new technology of Virtual Reality VR. Virtual Reality is technology with superior BER performance, subject to locations in a typical Industry.**

Keywords: **Aviation,BER performance, Cognitive load control, Virtual reality.**

I. INTRODUCTION

Virtual reality (**VR**) is a computer generated scenario that simulates a realistic experience. The immersive environment can be similar to the real world in order to create a lifelike experience grounded in reality or sci-fi. Current VR technology most commonly uses virtual reality headsets or multi-projected environments, sometimes in combination with physical environments or props, to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual or imaginary environment. A person using virtual reality equipment is able to "look around" the artificial world, move around in it, and interact with virtual features or items. "Virtual" has had the meaning "being something in essence or effect, though not actually or in fact" since the mid-1400s. The term "virtual" has been used in the computer sense of "not physically existing but made to appear by software" since 1959. Although we talk about a few historical early forms of virtual reality elsewhere on the site, today virtual reality is usually implemented using computer technology. There are a range of systems that are used for this purpose, such as headsets, Omni-directional treadmills and special gloves. These are used to actually stimulate our senses together in order to create the illusion of reality. Virtual reality can lead to new and exciting discoveries in these areas which impact upon our day to day lives. Wherever it is too dangerous, expensive or impractical to do something in reality, virtual reality is the answer. From trainee fighter pilots to medical applications trainee surgeons, virtual reality allows us to take virtual risks in order to gain real world experience. As the cost of virtual reality goes down and it becomes more mainstream you can expect more serious uses, such as education or productivity applications, to come to the fore. Virtual reality and its cousin augmented reality could substantively change the way we interface with our digital technologies. Continuing the trend of humanizing our technology virtual reality is the creation of a virtual environment presented to our senses in such a way that we experience it as if we were really there. It uses a host of technologies to achieve this goal and is a technically complex feat that has to account for our perception and cognition. It has both entertainment and serious uses. The technology is becoming cheaper and more widespread. We can expect to see many more innovative uses for the technology in the future and perhaps a fundamental way in which we communicate and work thanks to the possibilities of virtual reality. The concepts behind virtual reality are based upon theories about a long held human desire to escape the boundaries of the 'real world' by embracing cyberspace. Once there we can interact with this virtual environment in a more naturalistic manner which will generate new forms of human-machine interaction (HMI). The aim is to move beyond standard forms of interaction such as the keyboard and mouse which most people work with on a daily basis. This is seen as an unnatural way of working which forces people to adapt to the demands of the technology rather than the other way around. But a virtual environment does the opposite. It allows someone to fully immerse themselves in a highly visual world which they explore by means of their senses. This natural form of interaction within this world often results in new forms of communication and understanding.

II. BLOCK DIAGRAM

RECEIVER

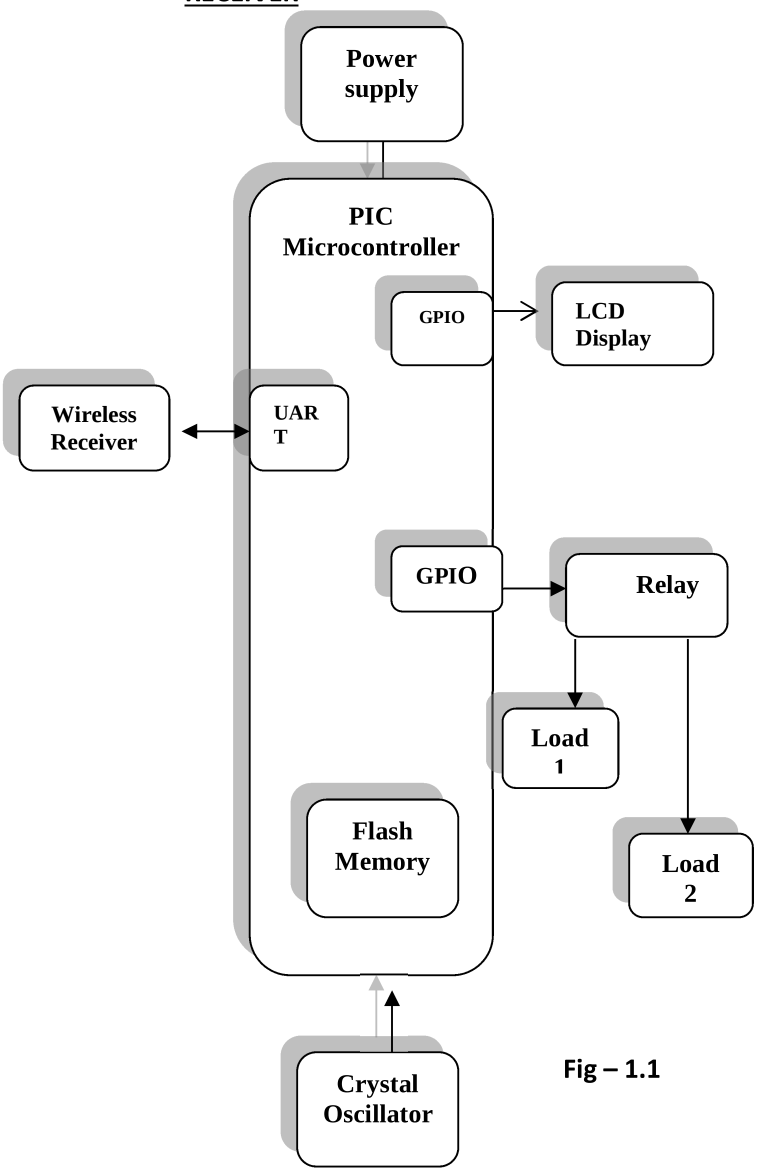

Fig – 1.1

TRANSMITTER

Fig – 1.2

III. REQUIRED COMPONENTS

3.1 Hardware components

3.1.1. PIC microcontroller

3.1.2. RELAY

3.1.3. LOAD

3.1.4. Crystal oscillator

3.2 Software components

3.2.1. EMBEDDED C

3.2.2. MPLAB

3.1.1 PIC microcontroller

Memory unit

Memory is part of the microcontroller whose function is to store data. For a certain input we get the contents of a certain addressed memory location and that's all. Two new concepts are brought to us: addressing and memory location. Memory consists of all memory locations, and addressing is nothing but selecting one of them. This means that we need to select the desired memory location on one hand, and on the other hand we need to wait for the contents of that location. Besides reading from a memory location, memory must also provide for writing onto it. This is done by supplying an additional line called control line. We will designate this line as R/W (read/write). Control line is used in the following way: if r/w=1, reading is done, and if opposite is true then writing is done on the memory location.

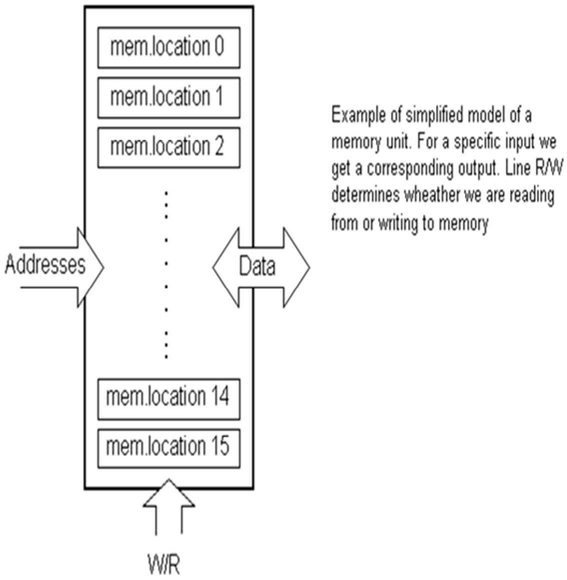

Fig – 1.3

Central Processing Unit

Let add 3 more memory locations to a specific block that will have a built in capability to multiply, divide, subtract, and move its contents from one memory location onto another. The part we just added in is called "central processing unit" (CPU). Its memory locations are called registers. Registers are therefore memory locations whose role is to help with performing various mathematical operations or any other operations with data wherever data can be found. Look at the current situation. We have two independent entities (memory and CPU) which are interconnected, and thus any exchange of data is hindered, as well as its functionality.

Bus

That "way" is called "bus". Physically, it represents a group of 8, 16, or more wires. There are two types of buses: address and data bus. The first one consists of as many lines as the amount of memory we wish to address and the other one is as wide as data, in our case 8 bits or the connection line. First one serves to transmit address from CPU memory, and the second to connect all blocks inside the microcontroller.

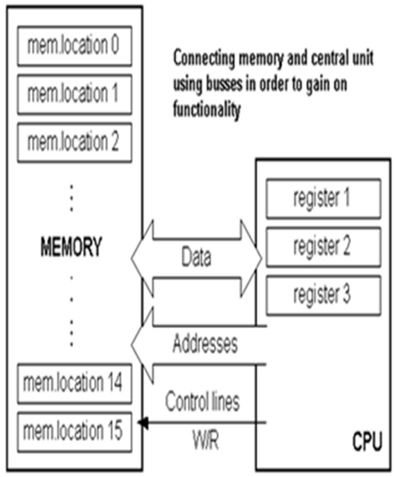

Fig-1.4 ***Representation of Bus***

Input-output unit

Those locations we've just added are called "ports". There are several types of ports: input, output or bidirectional ports. When working with ports, first of all it is necessary to choose which port we need to work with, and then to send data to, or take it from the port. When working with it the port acts like a memory location. Something is simply being written into or read from it, and it could be noticed on the pins of the microcontroller.

Serial communication

As we have separate lines for receiving and sending, it is possible to receive and send data (info.) At the same time. So called full-duplex mode block which enables this way of communication is called a serial communication block. Unlike the parallel transmission, data moves here bit by bit, or in a series of bits what defines the term serial communication comes from. After the reception of data we need to read it from the receiving location and store it in memory as opposed to sending where the process is reversed. In order for this to work, we need to set the rules of exchange of data. These rules are called protocol. Data goes from memory through the bus to the sending location, and then to the receiving unit according to the protocol.

Watchdog

One more thing is requiring our attention is a flawless functioning of the microcontroller during its run-time.

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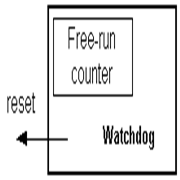


Fig-1.5 ***Watch dog timer***

Suppose that as a result of some interference (which often does occur in industry) our microcontroller stops executing the program, or worse, it starts working incorrectly. Of course, when this happens with a computer, we simply reset it and it will keep working. However, there is no reset button we can push on the microcontroller and thus solve our problem. To overcome this obstacle, we need to introduce one more block called watchdog. This block is in fact another free-run counter where our program needs to write a zero in every time it executes correctly. In case that program gets "stuck", zero will not be written in, and counter alone will reset the microcontroller upon achieving its maximum value. This will result in executing the program again, and correctly this time around.

Microcontroller with its basic elements and internal connections

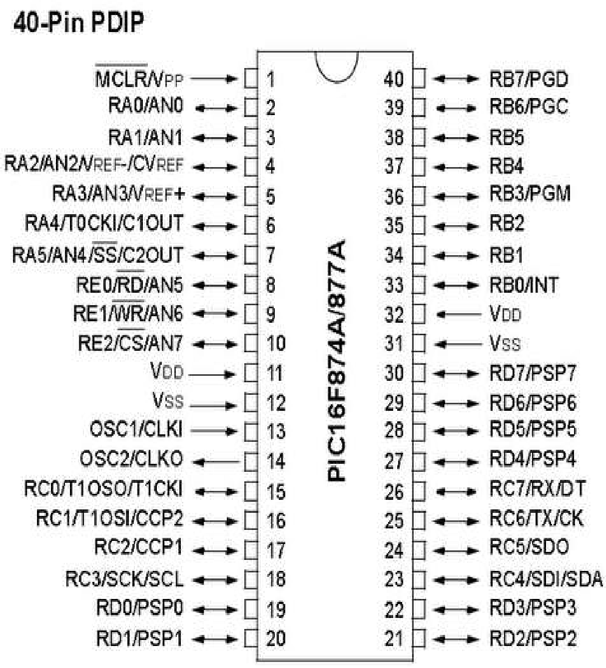


Fig – 1.6

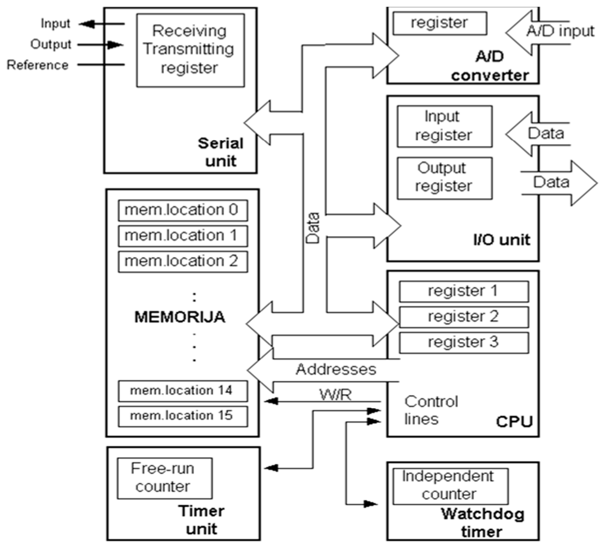


Fig – 1.7

PIC Microcontroller (PIC16F87X) Microcontroller Core Features:

• High-performance RISC CPU

• Only 35 single word instructions

• All single cycle instructions except for program branches which are two cycle

• Operating speed: DC - 20 MHz clock input DC - 200 ns instruction cycle

• Up to 8K x 14 words of FLASH Program Memory,

Up to 368 x 8 bytes of Data Memory (RAM)

Up to 256 x 8 bytes of EEPROM data memory

• Interrupt capability (up to 14 sources)

• Eight level deep hardware stack

• Direct, indirect and relative addressing modes

• Power-on Reset (POR)

• Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)

• Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation

• Programmable code-protection

• Power saving SLEEP mode

• Selectable oscillator options

• Low-power, high-speed CMOS FLASH/EEPROM technology

• Fully static design

• In-Circuit Serial Programming (ICSP) via two pins

• Single 5V In-Circuit Serial Programming capability

• In-Circuit Debugging via two pins

• Processor read/write access to program memory

• Wide operating voltage range: 2.0V to 5.5V

• High Sink/Source Current: 25 ma

• Commercial and Industrial temperature ranges

• Low-power consumption:

- < 2 ma typical @ 5V, 4 MHz

- 20 ma typical @ 3V, 32 kHz

- < 1 ma typical standby current

Oscillator Configurations: The PIC16F87X can be operated in four different oscillator modes. The user can program two configuration bits (FOSC1 and FOSC0) to select one of these four modes:

• LP Low Power Crystal

• XT Crystal/Resonator

• HS High Speed Crystal/Resonator

• RC Resistor/Capacitor

3.1.2 Relay

A relay is usually an electromechanical device that is actuated by an electrical current. The current flowing in one circuit causes the opening or closing of another circuit. Relays are like remote control switches and are used in many applications because of their relative simplicity, long life, and proven high reliability. Relays are used in a wide variety of applications throughout industry, such as in telephone exchanges, digital computers and automation systems. In the home, relays are used in refrigerators, washing machines and dishwashers, and heating and air-conditioning controls.

How do relays work?

All relays contain a sensing unit, the electric coil, which is powered by AC or DC current. When the applied current or voltage exceeds a threshold value, the coil activates the armature, which operates either to close the open contacts or to open the closed contacts. When a power is supplied to the coil, it generates a magnetic force that actuates the switch mechanism. The magnetic force is, in effect, relaying the action from one circuit to another. The first circuit is called the control circuit;the second is called the load circuit.

There are three basic functions of a relay: On/Off Control, Limit Control and Logic Operation.

On/Off Control: Example: Air conditioning control, used to limit and control a “high power”Load, such as a compressor

Limit Control: Example: Motor Speed Control, used to disconnect a motor if it runs slower or Faster than the desired speed

Logic Operation:

Example: Test Equipment, used to connect the instrument to a number of testing points on the device under test

Relay Mounting

There are several typical ways for relays to be mounted and terminated.

Socket – The spade lugs of the relay can be inserted into a mating tab or into a mating socket. The relay lugs carry one side of the termination. The mating side may be connected to a mating tab or mount into the connector designed for that relay package.

PCB Mounting – Wave solderable pins are provided that protrude from the inside of the relay to the outside and spaced (distance and height) according to the manufacturers determined design.The pins of the relay are inserted through holes in the Printed Circuit Board (PBC) designed to match the pin out of the relay and wave soldered to affix the relay to the PCB.

Chassis Mounting – Mounting ears, tabs or holes are designed as part of the relays mechanical package. Those locations typically accept nuts, bolts or screws to secure the relay to some sort of chassis. This chassis may function as a mounting location only or can also be used to provide thermal management (in higher power applications). The relay may also be secured to a PCB for

The purpose of stability.

3.1.3 Load

The load which we are going to use here is related to industries so they can vary from a small bulb to a large power supply. User can use the load of their desirability.

3.1.4 Crystal oscillator

A crystal oscillator is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters/receivers

The design principles of crystal oscillators

Crystal Oscillators are usually, fixed frequency oscillators where stability and accuracy are the primary considerations. For example it is almost impossible to design a stable and accurate LC oscillator for the upper HF and higher frequencies without resorting to some sort of crystal control. Hence the reason for crystal oscillators.

Oscillator types

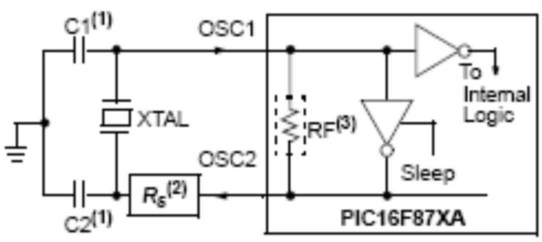
The PIC16F87XA can be operated in four different oscillator modes. The user can program two configuration bits (FOSC1 and FOSC0) to select one of these four modes:

- LP Low-Power Crystal
- XT Crystal/Resonator
- HS High-Speed Crystal/Resonator
- RC Resistor/Capacitor

Crystal oscillator/ceramic resonators

In XT, LP or HS modes, a crystal or ceramic resonator is connected to the OSC1/CLKI and OSC2/CLKO pins to establish oscillation. The PIC16Fs87XA oscillator design requires the use of a parallel cut crystal. Use of a series cut crystal may give a frequency out of the crystal manufacturer's specifications. When in XT, LP or HS modes, the device can have an external clock source to drive the OSC1/CLKI pin.

CRYSTAL/CERAMIC RESONATOR OPERATION (HS, XT OR LP OSC CONFIGURATION)



Note 1: See Table 14-1 and Table 14-2 for recommended values of C1 and C2.

2: A series resistor (R_S) may be required for AT strip cut crystals.

3: RF varies with the crystal chosen.

EXTERNAL CLOCK INPUT OPERATION (HS, XT OR LP OSC CONFIGURATION)

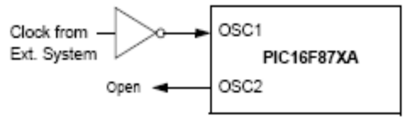


Fig – 1.9

CAPACITOR SELECTION FOR CRYSTAL OSCILLATOR

Osc Type	Crystal Freq.	Cap. Range C1	Cap. Range C2
LP	32 kHz	33 pF	33 pF
	200 kHz	15 pF	15 pF
XT	200 kHz	47-68 pF	47-68 pF
	1 MHz	15 pF	15 pF
	4 MHz	15 pF	15 pF
HS	4 MHz	15 pF	15 pF
	8 MHz	15-33 pF	15-33 pF
	20 MHz	15-33 pF	15-33 pF
Crystals Used			
32 kHz	Epson C-001R32.768K-A		± 20 PPM
200 kHz	STD XTL 200.000KHz		± 20 PPM
1 MHz	ECS ECS-10-13-1		± 50 PPM
4 MHz	ECS ECS-40-20-1		± 50 PPM
8 MHz	EPSON CA-301 8.000M-C		± 30 PPM
20 MHz	EPS		30 PPM

I

CERAMIC RESONATORS

Ranges Tested:			
Mode	**Freq.**	**OSC1**	**OSC2**
XT	455 kHz 2.0 MHz 4.0 MHz	68-100 pF 15-68 pF 15-68 pF	68-100 pF 15-68 pF 15-68 pF
HS	8.0 MHz 16.0 MHz	10-68 pF 10-22 pF	10-68 pF 10-22 pF
These values are for design guidance only. See notes following Table 14-2.			
Resonators Used:			
2.0 MHz	Murata Erie CSA2.00MG		± 0.5%
4.0 MHz	Murata Erie CSA4.00MG		± 0.5%
8.0 MHz	Murata Erie CSA8.00MT		± 0.5%
16.0 MHz	Murata Erie CSA16.00MX		± 0.5%
All resonators used did not have built-in capacitors.			

II

3.2.1 Embedded c

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as arithmetic, multiple distinct memory banks and basic I/O operations.

In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing.

Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements (if, switch case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc.

3.2.2 MPLAB

MPLAB is a proprietary freeware integrated development environment for the development of embedded applications on PIC and dspic microcontrollers, and is developed by Microchip Technology. MPLAB X is the latest edition of MPLAB, and is developed the netbeans platform. MPLAB and MPLAB X support project management, code editing, debugging and programming of Microchip 8-bit, 16-bit, and 32-bit PIC microcontrollers

MPLAB is designed to work with MPLAB-certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontrollers using a personal computer. PICK it programmers are also supported by MPLAB.

MPLAB X supports automatic code generation with the MPLAB Code Configurator and the MPLAB Harmony Configurator plugins.

IV WORKING

When the power supply is switched on the microcontroller has it's code i.e.., the respective operation to be done is embedded in it.Through the holo lens we will project the 2D image on to a surface which has a pixel value or the brightness which is less than the brightness of the image. When the particular surface of the image is touched it should perform the respective task such as the respective programmed load should be ON.

And when we touch it again the load should be OFF. In this the loads in the industry are operated respectively.

V. CONCLUSION

By using the virtual reality we can run real time objects. This can be used in the medical field, space field, aeronautical field.by using this we can reduce the manual effort and also the speed required for performing the particular task. In aeronautical field it takes coast of time also cost of human lives, through virtual reality we can save many human lives from danger unless or until it is not misused. As coming to the medical field a doctor or a nurse may not be available to take care of the patient every time, so by using virtual reality we can make it possible. Just to imagine how compatible is it to imagine a single 2D object to a complete industry.by using virtual reality we can control the places from where an actual human being cannot enter there. Through the advancement of virtual reality we can actually create miracles out of it.

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