iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** IV **Month of publication:** April 2024

DOI: https://doi.org/10.22214/ijraset.2024.60716

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

A Review Paper on Paint Spraying Robot

Kaveri Arote[1], Sakshi Jopale[2], Gauri Kashmire[3], Pankaj Nawale[4]
Electronics and telecommunication Department, Savitribai Phule Pune University

Abstract: ***Painting interior walls is a frequent construction task that takes a lot of time and work. Robotic painting was introduced to replace human manual activity, improving accuracy, efficiency, and lowering costs. In this study, We present an independent robot that paints walls. robot that uses a cascade lift mechanism to enable it to use a paint sprayer to paint a room's interior walls. The paint sprayer can reach the necessary heights With the assistance of of this mechanism for cascading lifts mechanism. With two degrees of freedom (DOF), The robot moves fluidly in each of the six directions. thanks to the DC powered mecanum wheels mounted down to its foundation. Ultrasonic sensors are used by the robot to measure distance, make adjustments to the walls, and determine if the mister has reached the wall's summit. The robot's mecanum wheels, ultrasonic sensors, and other components are all managed by the master controller. The AC power supply powers the entire system Color is sprayed on to manage the amount of color; sprayers are employed for this purpose. Sprayers need to split liquid into droplets that are the right size, distribute them evenly across the surface, and manage the volume of liquid to prevent overapplication. One major issue thataffects workers everywhere is disease control.***

Keywords: Spray painting, cascade lift, and an autonomous wall painting robot

I. INTRODUCTION

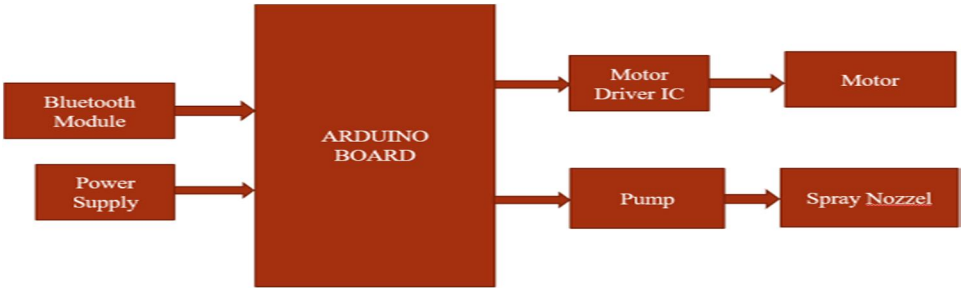
Spray painting is frequently a crucial step in the manufacturingprocess in the industrial sector. The precision and ease of painting have a direct impact on the finished product's perceived quality, particularly in the automotive sector. Manual spray painting is frequently employed for complicatedgoods or manufacture in small batches However, industrial robots often carry out the painting in highly automated large- scale production. The process of creating robot trajectories forusage in industrial paint booths has to be streamlined and improved. A unique spray paint optimization approach is proposed to make a generated starting trajectory as well as reduce the richness of the paint variances from the desired thickness. An interior point solver is used to solve a ongoing non-linear optimization issue to determine the smoothed trajectory A two-dimensional reference function for the paint thickness that has been applied is chosen by utilizing experimental data to fit a spline function Next, The footprint profile of this applicator is projected into the geometric to construct the model for paint deposition. Following a starting path segment the location and length of every trajectory section are employed as variables for optimization.

The optimization's principal objective is to create An applicator for paint trajectory that, given subsequently, could nearly precisely correspond to a target paint thickness.Two different cases have shown the algorithm's capacity to yield satisfactory outcomes, such as a basic two-dimensional test example and a sophisticated commercial instance requiring the painting the fender of a tractor The project aims to design well- functioning robot paths for automated booths for spray painting When employing robotic spray painting to apply aneven coat of paint to a surface at a predefined thickness, thetechnique described here can be used.

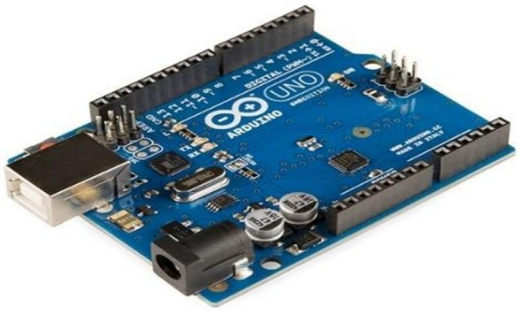
II. PROBLEM STATEMENT

Painting is frequently labour - intensive, repetitive task that takes a lot of time and costs money. worker exposure to toxic substances as well. In addition to the fact that robots used for manual painting and paint spraying mostly rely on human accuracy, automated spraying.

III. SYSTEM HARDWARE



1) Arduino Board



Technical Specification

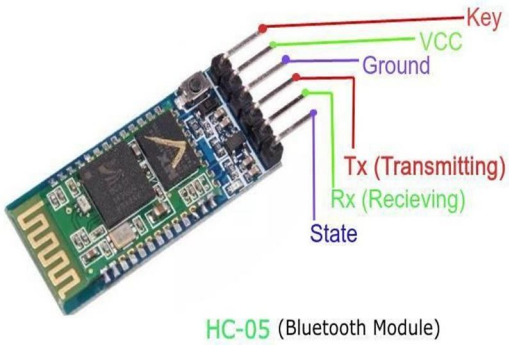
- IC: ATmega328P Microchip
- Uno board clock speed is 16 MHz, but the integrated
- circuit may reach a maximum of 20 MHz at 5V
- 32 KB of flash memory
- EEPROM: 1 KB
- Operating voltage: 5 volt
- number of peripherals: 1 each for UART, I2C,and SPI
- There are 14 digital I/O pins
- Pins for analog input: 6

2) Bluetooth Module

It is used in a various consumer uses, including wireless mice, keyboards, game controllers, headphones, and much more. Depending on the transmitter and receiver, environment, location, and urban surrounds, its range may be less than 100 meters. Establishing a wireless PAN, or personal area network, is made possible by the 802.15.1 IEEE protocol. It transmits data over the air using frequency-hopping spread spectrum (FHSS) radio technology. Serial communication is employed. for device communication. Through the serial port, it can interface with the microcontroller (USART).

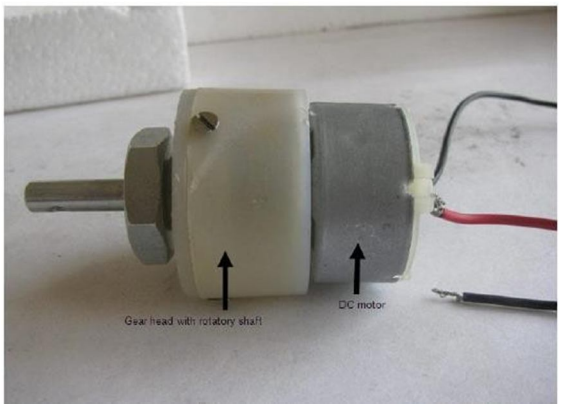
Features:

- Dimensions: 1.55 cm * 3.98 cm;
- Input voltage : 3.3-6 V
- Bluetooth version: 2.0 plus enhanced data rate, or EDR
- input power supply: 3.3–6 V
- prohibits greater than 7 V.
- ISM band frequency: 2.4 GHz.
- Class 2 transmit power
- Typical sensitivity is -80 dBm.
- Range: in open spaces, about ten meters



HC-05 (Bluetooth Module)

3) DC Motor



Any DC motor can be device that transforms electrical power from direct current into the power of machines. Usually, this type of motor is dependent on the magnetic field-generated forces. Whatever their kind, DC motors have an internal workings that can as electrical or electromechanical. A portion of the engines current flow direction is periodically changed in each situation

4) L293D Motor Driver

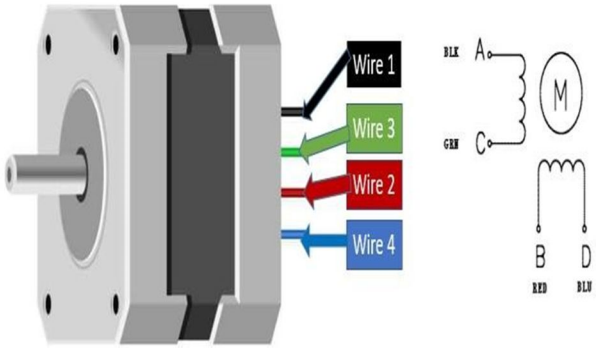
Specification

- Rpm ranges of 5,000–14,000 rpm
- Motor torque constant: 0.36 to 160 mNm
- Rotor design with no core.
- Minimal rotor inertia.
- A range of frame sizes, 8 to 35 mm

The pin diagram indicates that pins 2, 7 to the left and pins 15, 10 to the right are the L293D's four Pins for input While The engine on the right will rotate in accordance with the right inputpins, the motor connected to the left will revolve in accordancewith the left input pins. The motors' rotation is determined by the inputs that are delivered over as input pins eitherLOGIC 1 or LOGIC 0 To put it simply, we need to supply logic 0 or 1 across the input pins in order to rotate the motor.

5) Stepper Motor

DC motors that move in distinct increments are called stepper motors. They've got clusters of spirals grouped in divisions known as "phases" in them. The engine will turn little by little by activating each phase in turn. With accurate and well-controlled stepping placement and/or control of speed are achievable. Because of this, stepper motors are the recommended engine in numerous applications requiring accurate control of motion. Stepper motors are available in a variety of dimension, forms, as well as electrical properties.



- Dimensions: 42.3 mm × 48 mm, without the shaft
- 350 g in weight; 5 mm in shaft diameter; 200 stepseach revolution.
- Rated voltage: 4 V.
- Each coil's resistance is 3.3 Ω.
- Torque rest: 3.2 kg/cm

6) DC 12v Diaphragm Pump

Black color Water pump powered by a 12 volt DC battery Diaphragm 110 Psi, Max Amp 3.0, High-powered This self-priming 12 V pump is versatile and small, making it ideal for general-purpose clean water transfer. If you have limited storage space, this pump is the solution because it is smaller than a shoebox. Yet it is powerful enough to handle the most demanding workloads. 12V DC Battery Operated Pump, 50 PSI Max, 80 GPH Max, UV Protected Housing, Santoprene Valve and Diaphragms. Three chamber liquid diaphragm pump with built-in pressure switch. Self-priming suction lift of up to 8 vertical feet. This pump is perfect for marine, caravan/RV, and agricultural applications such as spraying, deck cleaning, water transfer, and so on.

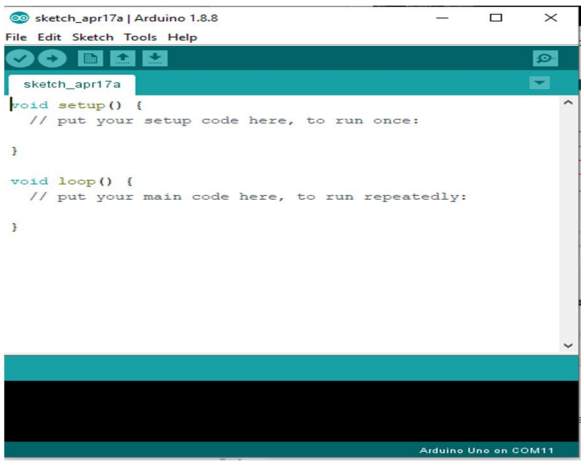
Features:

- DC 12V operating voltage
- Maximum flow: two to three liters per minute
- Maximum outlet pressure.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

IV. SOFTWARE REQUIREMENT

1) ARDUINO IDE:

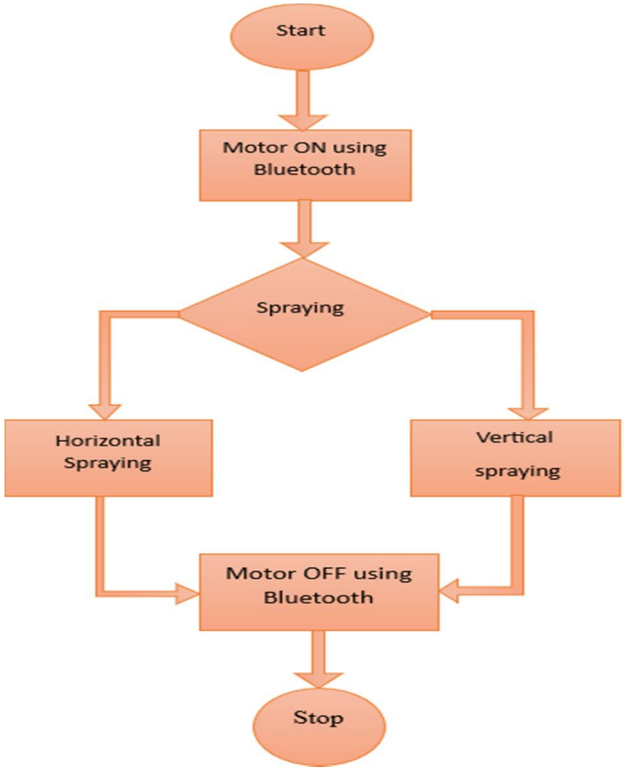


The Linux, macOS, and Windows platforms all support the cross-platform Arduino Integrated Development Environment (IDE). is composed of C and C++ routines. When third-party coresare used, it can also be used for creating and uploading software to other vendor development boards that are compatible with Arduino. the IDE's source code is released beneath the terms of theVersion 2 of the GNU General Public License. To assist C andC++, the Arduino IDE provides particular standards for codearchitecture. The IDE for Arduino comes with a software library that is part of the Wiring project offers a large number of standard input and output operations. It just takes two basic functions to build and link user-written code into a cyclic executive program that can be executed when using The GNU toolchain is further provided utilizing the IDE release. These methods are connected to a stub of a software named main () and are used to initiate the main program loop and the drawing.

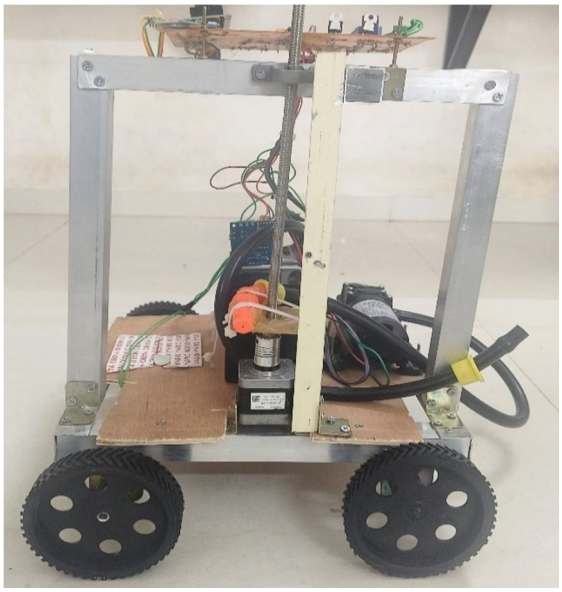
2) ARDUINO CAR

With the help of this creative program, you can Use an Androidsmartphone to operate any microcontroller with a Bluetooth module remotely Arduino may now be controlled by Bluetooth.It's easy to use the app: launch it, look for your Bluetooth moduleand establish a connection. After connecting, you will be able to use the app to transmit yourown unique commands to your Arduino board.

3) Flowchart



4) Hardware Result



V. CONCLUSION

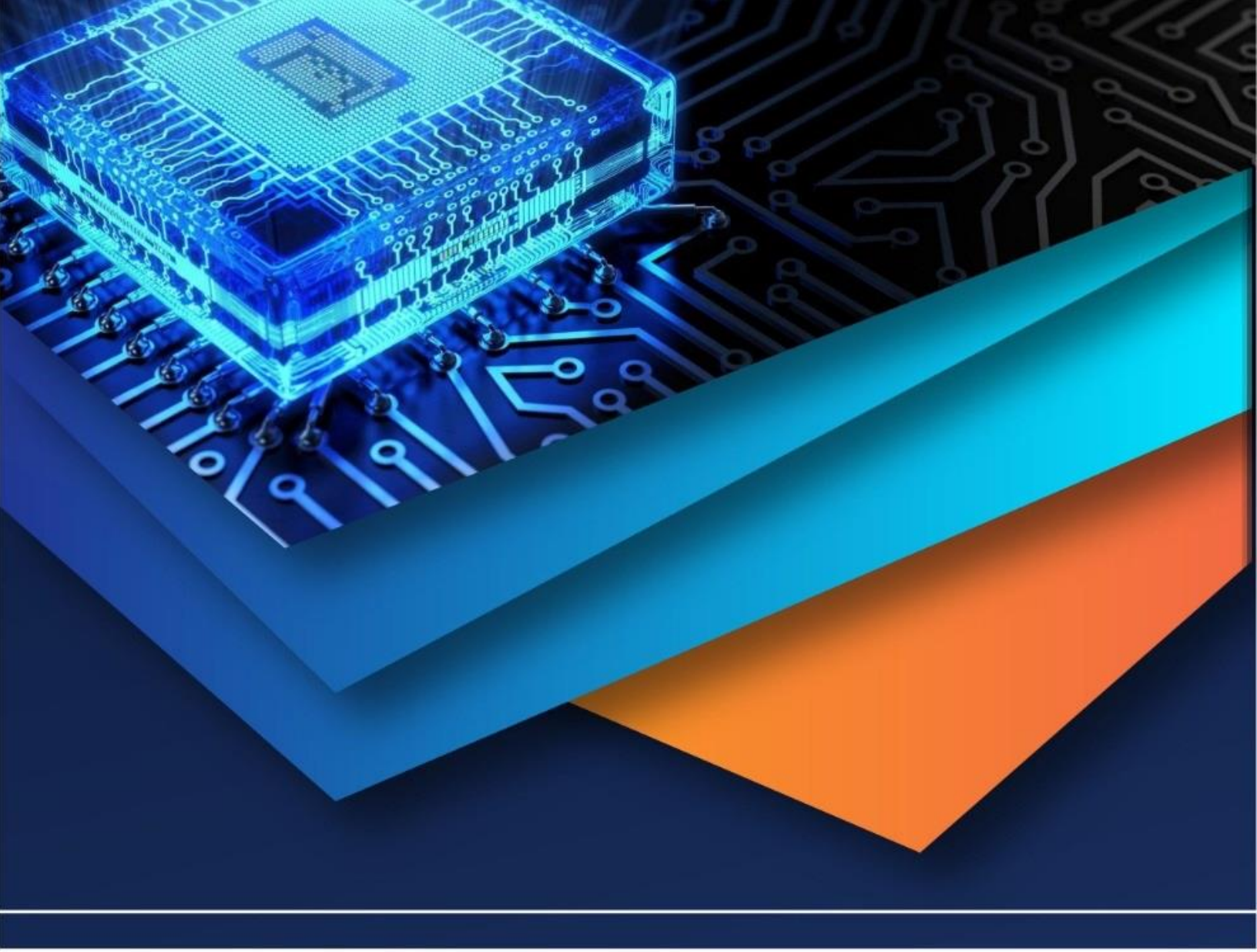
Robots that spray paint offer a revolutionary technology with major benefits for the building and remodeling sectors. Whenit comes to painting walls, these robots are more productive, accurate, and consistent, which results in shorter project durations and better paint utilization. Their capacity to navigate challenging terrain and safely navigate dangerous situations improves worker safety on construction sites. Theserobots are a favorite option for interior design because of theirpossible connection with smart buildings and residences, which will provide consumers with flexibility and ease.

VI. ACKNOWLEDGEMENT

We are grateful to a number of people who have supported our effort; without their assistance, it would not have been feasible. First and foremost, we would like to express our gratitude to Mr. Pankaj A. Nawale, our project guide, for his consistent and prompt assistance and direction during ourpreparation. We appreciate each and every project coordinator for their invaluable contributions to our endeavor.

REFERENCES

[1] Ramabhadran, R., Antonio, J. K., and Ling, T. L. "A framework for optimal trajectory planning for automated spray coating." 12 (1997): 124–134 in International Journal of Robotics and automation
[2] Hitoshi Tokunaga et al. "A Method to Solve Inverse Kinematics Problems Using Lie Algebra and its Application to Robot Spray Painting Simulation." Computers and Information in Engineering Conference and ASME 2004 International Design Engineering Technical Conferences. Society of Mechanical Engineers in America, 2004.
[3] Suh, S-H., Woo, I-K., and Noh, S-K. "Development of an automatic trajectory planning system (ATPS) for spray painting robots." Automation and Robotics, 1991. IEEE International Conference on Proceedings, IEEE, 1991.
[4] [4]A study was conducted by Asakawa, Naoki, and Yoshimi Takeuchi titled "Teachingless spray-painting of sculptured surface by an industrial robot." Automation and Robotics, 1997. Proceedings, 1997 IEEE, 1997; IEEE International Conference on, Vol. 3.
[5] Arıkan, Tuna Balkan, and MA Sahir. "Process modeling, simulation, and paint thickness measurement for robotic spraypainting." Robotic Systems Journal 17 (2000): 479–494.
[6] Ming Zhang. "Brief Introduction of Film Thickness Control During Paint Spraying by Robot." YU TUZHUANG XIANDAI TULIAO 6.60 (2006): 3
[7] Chen, Heping, and colleagues, "Automated robot trajectoryplanning for spray painting of free-form surfaces in automotive manufacturing." Automation and Robotics, 2002. Process. IEEE, 2002; ICRA'02: IEEE International Conference on. Vol.1.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY