iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VI **Month of publication:** June 2020

DOI: http://doi.org/10.22214/ijraset.2020.6069

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VI June 2020- Available at www.ijraset.com

Ion Thruster

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***Abstract:** A particle engine is one of the most encouraging electric engines for satellite control on account of its high explicit drive _ As the engine must be worked a large number of times during the station keeping strategic, self-ruling control work is vital for the impetus framework. The control framework plan and creation of the particle engine framework are depicted. The engine is a nonlinear-multivariable framework and its reaction is intricate because of plasma qualities. The reenactment framework which incorporates warm and plasma models is inferred for a structure tool_ The control grouping is planned under the imperatives of info power and the beginning up time of the engine. A few tests are done for the manufactured framework and the adequate exhibitions are checked. Its advantages over conventional propulsion include lower fuel weight, much higher fuel efficiency, and longer operational life. The NSTAR engine that operated on Deep Space 1 used electric propulsion. In propulsion systems, fuel efficiency is technically referred to as specific impulse or the amount of momentum increase for a given amount of fuel consumption. Given a sufficiently long mission time, an ion engine is able to achieve speeds far greater than any chemical rocket.*

***Keywords:** Micro-controller, Proximity Sensor, Eye ball Sensing, Motor Drivers, Geared Motors, Arduino.*

I. INTRODUCTION

What is propulsion? The word is gotten from two Latin words: Pro significance previously or advances and Pulsion importance to drive. Impetus intends to push forward or drive an item forward. An impetus framework is a machine that produces push to push an item forward. On planes, push is normally produced through some utilization of Newton's third law of activity and response. A gas, of working liquid, is quickened by the motor, and the response to this increasing speed delivers a power on the motor. Rocket impetus is any. technique used to quicken shuttle and fake satellites. There are a wide range of strategies. Every technique has downsides and focal points.

In any case, most rocket today are moved by constraining a gas from the back/back of the vehicle at exceptionally rapid through a supersonic de Laval spout. Ion propulsion is a new technology that has been fully tested and implemented in experimental space craft. Research in to this unique type of propulsion began in 1950's. Commonly referred to as electric propulsion, ion propulsion system are particular types of electric propulsion.

The most noticeable difference between a fully load conventional rocket and an electric propulsion system would be the mass of fuel required to produce thrust. While conventional chemically few led rocket require millions of kilograms of propellant, ion propulsion system required only a small amount of propellant by comparison. Also all electric engines are highly efficient and reliable, making them excellent choice long, unattended operation. One of the most applicable areas for electric propulsion is space exploration.

II. WHAT IS ION THRUSTERS

In March of 2015 NASA's Dawn space probe settled into orbit around its final destination after a long trek across the solar system. In doing so, it became the first spacecraft to orbit two extraterrestrial objects (an earlier stop being Vesta – another dwarf planet). Just over one tenth of Dawn's 1240 kg (wet) mass is contained in its ion propulsion system. This propulsion system, using a 450 kg tank of xenon gas, along with a gravitational assist by Mars, allowed the spacecraft to orbit multiple targets, where the use of chemical propulsion in the past has only allowed spacecrafts to study multiple targets during flybys, due to the much larger fuel consumption. The efficiency of the xenon ion propulsion system coupled with long periods of time for acceleration allowed for the probe to achieve a ΔV of 11 km/s despite the very small thrust provided (< 92mN).

In light of these impressive statistics for just one of many missions using a xenon ion thruster, it is not hard to imagine why the number of missions employing them as their propulsion system has been increasing ever since the first successful implementation (Deep Space 1, launched in 1998), nor why they have become a favourite among science fiction writers.

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III. MECHANISM OF ION THRUSTERS

ION Thrusters Consist of three process Ionization, Acceleration and Neutralization. First the propellant is ionized by the electrode in Ionization chamber then in acceleration chamber ion is accelerated according to the potential difference between electrode then the ion beam is neutralized with the help of neutralizer.

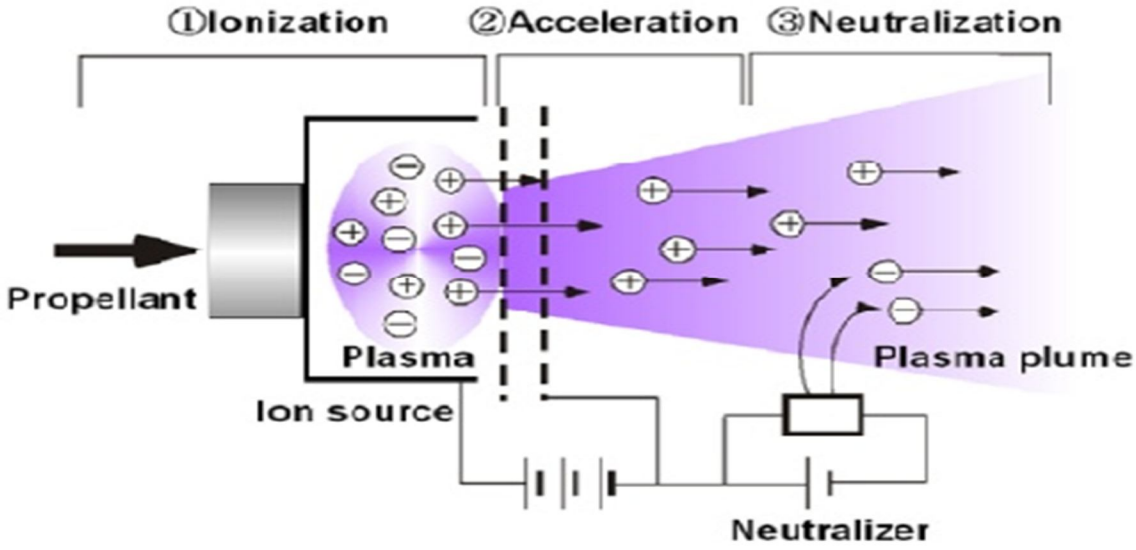


Figure-1 Mechanism of ION Thrusters

IV. WORKING OF ION THRUSTERS

A particle engine ionizes fuel by adding or expelling electrons to create particles. Most engines ionize fuel by electron assault: a high-vitality electron (negative charge) slams into a force iota (impartial charge), discharging electrons from the charge particle and bringing about an emphatically charged particle. The gas created comprises of positive particles and negative electrons in extents that bring about no general electric charge. This is known as a plasma. Plasma has a portion of the properties of a gas, however it is influenced by electric and attractive fields. Regular models are lightning and the substance inside glaring lights.

The most widely recognized force utilized in particle drive is xenon, which is effectively ionized and has a high nuclear mass, in this manner creating an alluring degree of push when particles are quickened. It likewise is dormant and has a high stockpiling thickness; in this way, it is appropriate for putting away on rocket. In most particle engines, electrons are produced with the release empty cathode by a procedure called thermionic emanation. Electrons created by the release cathode are pulled in to the dis-charge chamber dividers, which are charged to a high positive potential by the voltage applied by the engine's release power gracefully. Nonpartisan force is infused into the release chamber, where the electrons shell the fuel to deliver decidedly charged particles and discharge more electrons. High quality magnets keep electrons from unreservedly arriving at the release channel dividers. This stretches the time that electrons dwell in the release chamber and expands the likelihood of an ionizing occasion.

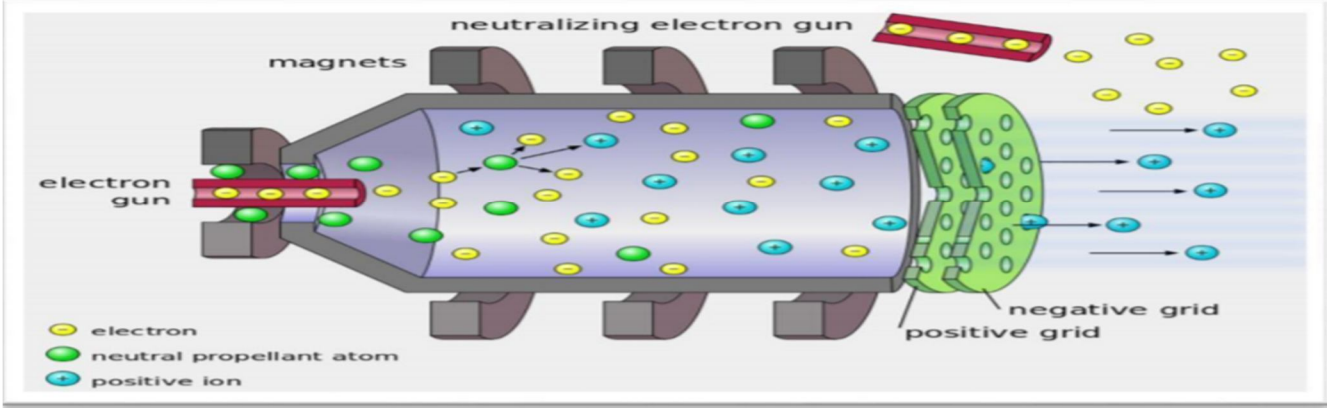


Figure-2 DIAGRAM OF ION THRUSTERS

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The decidedly charged particles move toward frameworks that contain a great many decisively adjusted openings (gaps) at the rearward finish of the particle engine. The main lattice is the decidedly charged cathode (screen matrix). An extremely high positive voltage is applied to the screen matrix, however it is designed to compel the release plasma to live at a high voltage. As particles go between the lattices, they are quickened toward a contrarily charged anode (the quickening agent matrix) to extremely high accelerates (to 90,000 mph). The emphatically charged particles are quickened out of the engine as a particle shaft, which produces push. The neutralizer, another empty cathode, ousts an equivalent measure of electrons to make the complete charge of the fumes shaft unbiased. Without a neutralizer, the shuttle would develop a negative charge and in the end particles would be moved back to the rocket, decreasing push and causing rocket disintegration.

V. CONCLUSION

We have discussed the general types of ion thrusters in use and how the technology used in particle accelerators might help to increase the acceleration by ion thrusters by helping to increase the ion exhaust speed. It was determined that, while many methods are unreasonable for implementation in an ion drive, a cyclotron could, potentially be used, if an incredibly light source of very high electrical current were to be used to power it, and a very light conducting material were used for construction of the dees. We also found that RF cavities might be used to increase the velocities, but again, would rely of very strong power sources with next to no mass. As things sit right now, technologically speaking, ion thrusters don't stand to gain much in the way of effectiveness by the application of acceleration methods stolen from particle accelerators. As a means of propulsion, though, they have great potential.Whereas chemical propulsion is highly unsuitable for deep space missions, ion thrusters are also making it possible to reach out further into deep space. The utilization of particle engines for close Earth missions that are by and by happening proposes that a consistent development in particle engine use can be normal. Such development is viewed as likely over the wide scope of explicit driving forces related with missions in which either payload part or impetus framework push to-control proportion are boosted.

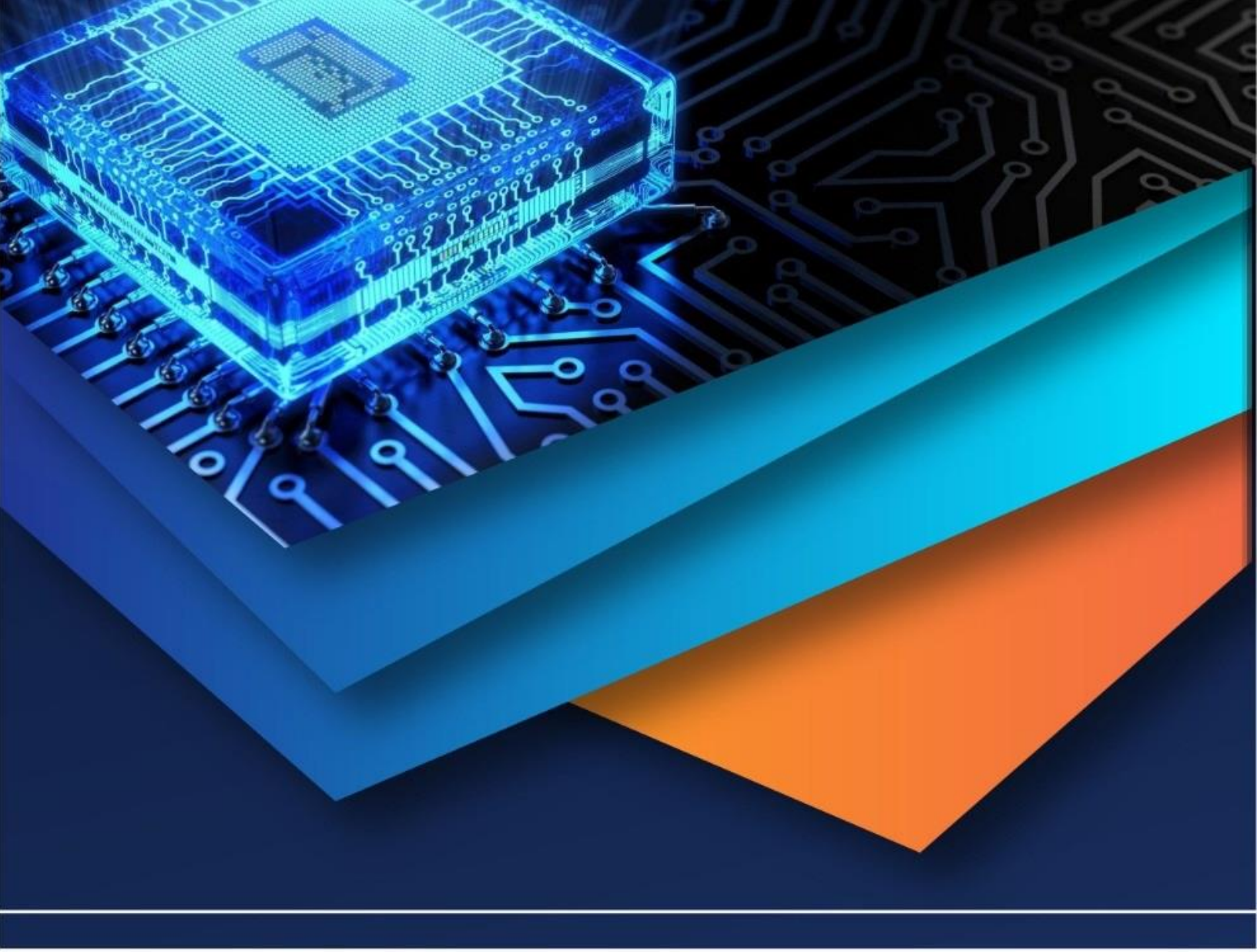
VI. ACKNOWLEDGMENT

I would like to express my gratitude to all the people that made possible the elaboration of this study. I would like to specially thank to my supervisor, Brijesh Kumar Dubey Sir from Electrical & Electronics Department PSIT-Kanpur. His contribution to the study has been essential to complete a high-quality research paper, given my initial limited awareness about space propulsion. Moreover, his support and enthusiasm have encouraged me to continue my efforts to investigate and broaden my knowledge on the fascinating world of space engineering.

REFERENCES

[1] Gneo, M., Severini, G., Conforto, S., Schmid, M., & D' Alessio, T. (2011). Towards a Brain-Activated and Eye-Controlled Wheelchair. international Journal of Bioelectromagnetism,pp 44-45.
[2] Pai, S., Ayare, S., & Kapadia, R. (2012). Eye Controlled wheelchair. International Journal of Scientific & Engeering Research,pp 1-5.
[3] Manuel Mazo, Francisco J. Rodriguez, Jose L, Lazaro, Jesus Urena, Juan C. Garcia, Enrique Santiso, Pedro Revenga and J. Jesus Garcia, "Wheelchair for Physically Disabled People with Voice, Ultrasonic and Infrared Sensor Control ", Autonomous Robots, vol.2, no. 3, pp. 203-224 ,Sep 1995
[4] Tabasum Shaikh, Naseem Farheen Sayyed, Shaheen Pathan, "Review of Multilevel Controlled Wheelchair", 4th National Conference On Electronic Technologies, pp. 275-279, April 2013.
[5] Raymond A. Serway and John W. Jr Jewett. Physics for Scientists and Engineers with Modern Physics. Brooks Cole, 2003.

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