Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act, 1956)
(Vide Notification No. F.9-5/2000 - U.3, Ministry of Human Resource Development, Govt. of India, dated 4th July 2002)
Phone : 044-22290742 / 22290125 . Telefax : 044-22293886
Website : www.bharathuniv.ac.in
173, Agaram Road, Selaiyur, Tambaram,
Chennai - 600 073. Tamil Nadu.

Ref No. SMS-2018-O-5

Date : 07/10/2018

TO

Mr.J.Dhanasekaran,

Asst Prof/Mechatronics,

BIHER

Thro: Concern Head of the Department

BHARATH INSTITUTE OF HIGHER EDUCATION & RESEARCH
(Declared as Deemed to be University U/S 3 of UGC Act.1956)
-7 OCT 2018
OFFICE OF THE DEAN-RESEARCH
Selaiyur, Chennai-600 073. INDIA

Greetings!!!

We are happy to announce that the Research Advisory Committee has approved your proposal for Seed Money Scheme-2018 which was presented by you. You are requested to complete the proposal and send the progress report to the Dean Research in the prescribed time period.

Title of the Project: Optimization of robot grasping Synthesis

Seed Money Amount: Rs.1,00,000/- (Rupees One Lakh Only)

Approved on : 27/09/2018

Payment details:

Cheque No. 351625 Dated: 09/10/2018

Bank Name: Indian Bank, Selaiyur, Chennai.

With Regards

Dean-Research

Received
J. Dhanasekaran.

1

इंडियन बैंक
Indian Bank

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PAY Mr. T. Dhanasekar. या धारक को OR BEARI

RUPEES रुपये One Lakh Only

अदा करें ₹ 1,00,000/-

खा.सं. A/c No. CA 6670628110

FOR BIHER RESEARCH AND CONSULTAN

CBS Code: 02505

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Please sign abo

⑈351625⑈ 600019250⑆ 628110⑈ 29

PROPOSAL SUBMISSION

1. **Details of Principal Investigator**

Name	: Dhanasekar.J
Designation	: Assistant Professor
Highest Qualifications	: M.E., M.B.A
Department	: Mechatronics
E-mail	: jdhanasekar81@gmail.com
Contact no	: 9841259514
Date of Joining	: 02.01.2013

2. **Details of Co - Principal Investigator**

Name	: Dr.P.Sengottuvel
Designation	: Professor & Head
Highest Qualifications	: M.E., Ph.D.
Department	: Mechatronics
E-mail	: dr.p.sengottuvel@gmail.com
Contact no	: 9884651785
Date of Joining	: 05.08.2013

Technical details

1. Introduction

The research of object grasping and manipulation becomes formidable challenging area. The need of the research on grasp and manipulation analysis and planning is can be applied to the real world. So increase the efficient and implementable methods to perform these analysis and planning tasks. Grasping is one of the most fundamental problems in robotics. Robot grasping is a major problem that includes control, planning and tendency to judge the pickup points of various objects. In unstructured environments, familiar types of objects may contain a variety of shapes and sizes. Even though there exist these variations, humans can learn how to grasp objects by few numbers of examples and generalize the learned skills to grasp novel objects. However, a robot in an unstructured environment may encounter problems regarding objects because of apriori experience or knowledge. On such situation robot requires sophisticated perception, planning and control for grasping the object. Grasping planning can be classified into knowledge based, behaviour based and model based methods. The function of a robot gripper is to grasp and manipulate the object by its fingers. The task of restraining objects, sometimes called fixturing and the task of manipulating objects with fingers is called dexterous manipulation. From the image of object, a location for good grasping is identified and every different object can have some similar subparts. .A wide variety of novel object has been tested by grasping knowledge base approach and the result establishes the effectiveness of this approach so as to achieve quick and good grasps of novel objects. If the testing is carried for so many novel objects, grasping knowledge base approach will enrich and serve as a best experience towards robot gripping.

2. Review of status of Research and Development in the subject

Saxena A, Driemeyer J and Ng A (2008), Robotic grasping of novel objects using vision. The International Journal of Robotics Research 27: 157.

To obtain the grasping point, they divide the object into small rectangular patches, and for each rectangular patch we predict whether if it contains a projection of grasping point on the image plane. To use a set of features such as edges, textures, colors for the prediction and use logistic regression to model the probability of a 2-D position being a good grasping point. 2-D image at different orientation of the object was obtained, and for each image we obtain the grasping point. These 2-D grasping points are triangulated to obtain a 3-D image of the grasping point.

Pei-Chi Huang et al., Grasping Novel Objects with a Dexterous Robotic hand through Neuroevolution, IEEE-CICA, doi: 10.1109/CICA.2014.7013242, 2014.

P Huang et al (2010) proposed the partial automation of the robotic grasping of novel objects. This approach has two stages. In the first stage a human supervisor defines a boundary box around the target object by means of interface. The second stage is fully automated where the robot uses the vision system for grasp planning and to determine the robotic hand configuration, orientation, and location. Neuroevolution approach is applied in order to make the second stage

automatic (i.e.) evolving a Artificial Neural Network (ANN) with an evolutionary algorithm. They have used Neuro Evolution of Augmenting Topologies (NEAT) algorithm. The controllers receive low level real time vision features from a Kinect sensor. The grasping is simulated using GraspIt! Simulator and the simulated data is tested using a robot called Dreamer, and this method have produced promising results

A T Miller et al., Automatic Grasp Planning Using Shape Primitives, 2003 IEEE International Conference on Robotics and Automation, DOI: 10.1109/ROBOT.2003.1241860, Print ISSN: 1050-4729.

A T Miller et al., (2003) proposed a set of rules to generate a set of grasp starting positions and pre-grasp shapes, by modeling any unknown object as a set of shape primitives such as cylinders, spheres, cones and boxes. They generated grasping strategies for each simple shapes and each grasp has been tested and evaluated within their grasping simulator GraspIt!

B. Wang, L. Jiang, J. LI, and H. Cai, "Grasping unknown objects based on 3d model reconstruction," in Proc. IEEE/ASME International Conference on Advanced Intelligent Mechatronics, 2005, pp. 461-466.

B. Wang et al., (2005) proposed modeling and grasping of unknown object based on 3-D model reconstruction. The object is scanned by 3-D laser scanner and reconstructed in simulation. The grasping quality depends on the evaluation of different grasping postures in simulation scene. Based on evaluation, the perfect grasping will be executed.

Richtsfeld M and Vincze M (2011) Robotic grasping of unknown objects. In: Goto S (ed) Robot arms. InTech, Rijeka, Croatia, pp 123–136

M Richatsfeld and M Vincze (2011) proposed grasping of novel object based on laser range and stereo data using laser range and camera position. The 2.5D point clouds data has been obtained and tested for their grasping point detection algorithm separately on laser range and single stereo images to combine both the results to obtain good grasping.

Mario Richtsfeld, Markus Vincze., (2008) Grasping of Unknown Objects from a Table Top. Workshop on Vision in Action: Efficient strategies for cognitive agents in complex environments, Oct 2008, Marseille, France.

M Richatsfeldand MVincze (2008) proposed vision based grasping system for novel objects based on range images. They realize a synthesis of the calculated grasp points with 3D model of the gripper. This algorithm analyzes the top surface of unknown object and grasp points and gripper pose are generated to grasp the desired novel object. This algorithm consists of five main steps and are, raw data pre-processing, range image segmentation, grasp point detection, calculation of the optimal hand pose ,transmission of the calculated object pose and hand pose to the path planning tool.

2.1 International Status: NIL

2.2 National Status: NIL

2.3 Importance of the proposed project in the context of current status including scientific objective:

Modern day robotics aims at bringing precision and motor dexterity of human being into machines. Over the last decades the research area in the field of robotic grasping has emerged. In the starting stages the robots were pre-programmed to hold different objects. The pre-programming method had a particular disadvantage.When a different object was placed which did not confirm to the program the end effectors would either not pick the object or the object would be damaged. Another problem faced by the robot gripper involves the amount of gripping force that has to be exerted on the object. The force exerted on an egg cannot be the same as that to grip a concrete block. This gripping force is also dependant on the nature of the material that is being used. It is essential to identify and understand the consistency of the object and use appropriate grasping technique from its memory which is learnt from different neural based techniques.

The proposed work is to create a simulation based model of a manipulator which is taught different materials and grasping methods to grasp based on which the robot in simulation must be able to take decision as to grasp a new novel object out of its database and be able to handle the object dynamically.

3. Progress/achievement so far,

a) Reference papers was collected.

b) Literature survey was studied.

c) Proposal work has been started in the robot grasping of novel objects.

4. Work Plan:

4.1 Methodology:

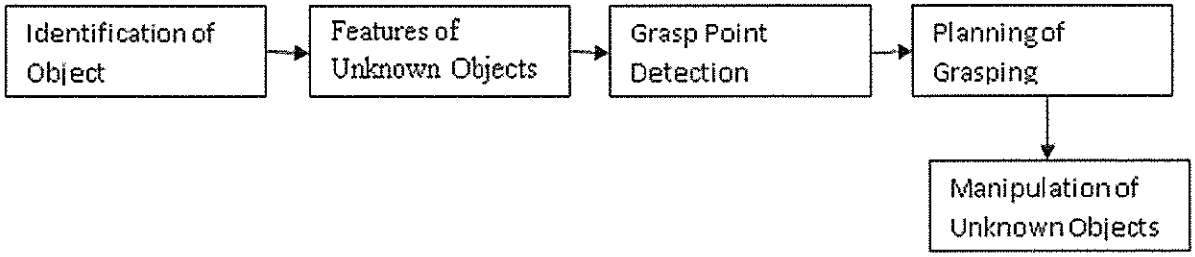
The main objectives of the robot grasping of novel object as follows,

- To design and fabrication of six axis robot.
- To simulate six axis robot with different geometrical shapes.
- To analysis the grasp force for different material
- To analysis the performance of robot grasping with different algorithm.
- To optimize the robot grasping for novel objects.

The method of this work to grasp unknown objects by determining the centre of mass and dimensions of the object with the help of a camera. The objects shape and dimensions are scanned and calculated by using the camera. The algorithm is provided to predict the structure of an unknown object. For example, the robot is performing the pick and place operation for the objects which is pre-programmed and suddenly a different object is placed then the robot will visualize the object through camera and search for algorithm in the database and finally it is

executed. If there is no data about the object in the database then the robot will execute the work by the combination of different objects in the database.

Block Diagram:



4.2 Time Schedule of activities giving milestones through BAR diagram.

Work plan (including detailed methodology and time schedule)

Sl. No.	Activity / Milestone	1st Year		2nd Year	
1.	Literature review	**1-6**			
2.	Design and its fabrication of the robot		**7-12**		
3.	Analysis of robot			**13-18**	
4.	Testing of robot				**19-24**

Month /Activities	1-6	7-12	13-18	19-24
Literature survey				
Design and its fabrication of the robot				
Analysis of robot				
Testing of robot				

4.3 Expected outcome within the time period of Seed Money Scheme

a) Prototype robotdesign can be implemented within the time period of Seed Money Scheme.

b) For a real time work can be done within the time period of Seed Money Scheme.

5. Suggested Plan of action stating the name of funding agency where the project will be communicated for financial support within the time period of project.

Nil

6. Bibliography: Nil

7. List of Projects submitted/implemented by the Investigators (Separate for Pi and Co-PI)

Nil

7.1: Details of Projects submitted to various funding agencies

S.No	Title	Cost in Lakhs	Month of Submission	Role of PI/Co PI	Agency	Status

7.2 Details of Projects under implementation

7.3

Sl. No.	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	-	-	-	-	-

7.3 Details of Projects completed during the last 5 years

Sl. No.	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	-	-	-	-	-

8. List of publications published by the Investigators, if any:

i. Co - Principal Investigator

1. C.Fradric John, R.Christu Paul, S.ChristopherEzhil Singh and P.Sengottuvel, Wear Behavior of Al-12Si-xZrC Composite Using Response Surface Methodology. Journal of Advanced Research in Dynamical & Control Systems, (ISSN:1943-023X), 83-89,13,2017.

2. P.Sengottuvel., The Stern Tube oil pollution in Ocean and Use of Composite material to reduce it- A Review. International Journal of Advance Research in Science and Engineering(IJARSE), (ISSN No: 2319-8354), 2017, 06.
3. P.Sengottuvel andK.Jessy., Fuzzy Rule based Modeling of Drilling Parameters for Tool Wear in Drilling GFRP Composites. Indian Journal of Science and technology, Informatics Digital Publication, India, (ISSN:0974-5645), 8(31),1-6, 2015.
4. P.Sengottuvel and G.Manikandan., Machining Characteristics Analysis on EDM for INCONEL 718 Material Using Copper Electrode.International Journal of Innovative research In science, Engineering and Technology(IJIRSET), Ess&Ess Publications, India, (ISSN: 2319-8753), 9378-9383, 4(9), 2015.
5. G.Manikandan, J,Dhanasekar, S,Sridevi and Sengottuvel.P.,Dynamic Ball Tracking and Hitting Robot Using Vision System . International Journal of Innovative research In science, Engineering and Technology(IJIRSET), Ess&Ess Publications, India, (ISSN: 2319-8753), 6148-6153, 4(7), 2015.
6. J,Dhanasekar,Sengottuvel.P, G.Manikandan and M. Deepa., Development of a Robotic Arm for Dangerous (Explode) Object Disposal . International Journal of Innovative research In science, Engineering and Technology(IJIRSET), Ess&Ess Publications, India, (ISSN: 2319-8753), 4058-4065, 4(6), 2015.
7. P.Sengottuvel, and G.Manikandan ., Desirability Approach Optimization in EDM for Inconel 718. International Journal of Innovative research In science, Engineering and Technology(IJIRSET), Ess&Ess Publications, India, (ISSN: 2319-8753), 4654-4660, 4(6), 2015.
8. Padmini.P, Shanmuganathan.B, Senthamilperarasu.S and Sengottuvel.P., An Investigation of the Influences of EDM parameters and Tool Geometries for Monel 400 Material with Copper Electrode. International Journal of Applied Engineering Research (IJAER), Research India Publications, India,(ISSN:0973-4562),10(13), 10961-10969,2015, Annexure-2, Impact Factor=0.13.
9. Shanmuganathan.B,Padmini.P and Sengottuvel.P., Effects Of Electrical Process Parameters And Electrode Tool Geometries In EDM Of Monel 404 Material Using Nickel Silicon Chromium Copper Electrode. International Journal of Applied Engineering Research (IJAER), Research India Publications, India,(ISSN:0973-4562),10(13), 10971-10975,2015, Annexure-2, Impact Factor=0.13.
10. NRR.Anbusagar, K.Palanikumar, R.Manokaran and P.Sengottuvel., Flexural and impact properties of 2D and 3D Jute/GF/epoxy hybrid composite materials. International *Journal of Applied Mechanics and Materials*,Transtech Publisher, USA,(ISSN: 1660-9336), 766-767,178-182, 2015. Annexure-2,Impact Factor=0.137.
11. NRR.Anbusagar, K.Palanikumar, R.Vigneswaran, M.Rajmohan and P.Sengottuvel. Tensile and Flexural properties of glass fibre reinforced nano polymer composite panels. International *Journal of Applied Mechanics and Materials*,Transtech Publisher, USA,(ISSN: 1660-9336), 766-767,372-376, 2015. Annexure-2, Impact Factor=0.137.

12. P.Karunakaran,J.Arun,V.Palanisamy,NRR.Anbusagar and Sengottuvel.P., Performance and Analysis of Silicon Mixed Kerosene Servotherm in EDM of Monel 400, International *Journal of Applied Mechanics and Materials*,Transtech Publisher, USA,(ISSN: 1660-9336), 766-767,674-680, 2015. Annexure-2, Impact Factor=0.137.
13. Sengottuvel.P,V.Palanisamy,J,Arun ,NRR.Anbusagar and J.HameedHussain., EDM Process Parameters Optimization Using Taguchi Method, International *Journal of Applied Mechanics and Materials*,Transtech Publisher, USA,(ISSN: 1660-9336), 766-767,867-872, 2015. Annexure-2, Impact Factor=0.137.
14. Senthamilperarasu,Padmini.P,Shanmuganathan,NRR.Anbusagr and Sengottuvel.P., Effects Of Electrical Process Parameters And Electrode Tool Geometries In EDM Of Inconel825 Material Using Zirconium Copper Electrode, International *Journal of Applied Mechanics and Materials*,Transtech Publisher, USA,(ISSN: 1660-9336),766-767,668-673, 2015. Annexure-2, Impact Factor=0.137.
15. Padmini.P, Senthamilperarasu, P,Shanmuganathan,NRR.Anbusagr and Sengottuvel.P., An Investigation Of The Influences Of EDM Parameters And Tool Geometries On Radial Overcut For Monel 400 Material With Tungsten Copper Electrode, International *Journal of Applied Mechanics and Materials*,Transtech Publisher, USA,(ISSN: 1660-9336), 766-767,908-913,2015,Annexure-2, Impact Factor=0.137.
16. Muthuraman.V,Ramakrishnan.R, Karthik.K , Latheesh Kumar and Sengottuvel.P,ANN Modelling of Wire-electro discharge machined WC-Co Metal Matrix Composite, International Journal of Applied Engineering Research(IJAER), Research India Publications, India,(ISSN: 0973-4562),10(8),6354-6362,2015. Annexure-2, Impact Factor=0.13.
17. Elango.P and Sengottuvel.P., An Experimental Study of Welding for Stellite6 Overlay on Inconel825 using PTAW Process,International Journal of Advanced Scientific Research & Development(IJASRD), ISSN:2394-8906, 2(01),168-176,2015,Aneexure-2,Impact factor=2.87.
18. P.Sengottuvel and P.Vijayabalan, Performance and Emission of an LPG Diesel Fuel Engine with Dual Fuel Engine with Glow Plug. Journal of Advances in Mechanical Engineering and Technology, Chrome Publication, India, 1(1), 1-7, 2015.
19. S,Sridevi, G.Manikandan, J,Dhanasekar, and Sengottuvel.P.,Design of Fire Fighting Robot . International Journal of Innovative research In science, Engineering and Technology(IJIRSET), Ess&Ess Publications, India, (ISSN: 2319-8753), 17141-17144, 3(11), 2014.
20. P.Karunakaran, C.Jegadeesan, C.Rangasami, andSengottuvel, P., Sugar Industry Fly Ash: An Additive for molding sand to make aluminum castings. Russian Journal of Non-Ferrous metals, Allerton Press, Inc, Newyork, (ISSN: 1067-8212), 55(3), 247-253, 2014. Annexure-1/ Springer, Impact Factor=0.121.
21. P.Karunakaran,Sengottuvel.P, and J.Arun. Casting Simulation of Iron Castings for Improved Productivity of Foundries. International Journal of Applied Engineering Research(IJER), Research India Publications (RIP), India, (ISSN: 0973-4562), 2014, 9/26,8798-8802, Annexure-2,Impact Factor=0.13.

22. NRR.Anbusagar, Prabnivas.C, Nagaraj.M, and Sengottuvel.P. Dynamic Analysis of Nanoclay Infused Polyester Resin GFR-Jute Hybrid Sandwich Laminates. International Journal of Applied Engineering Research (IJER), Research India Publications (RIP), India, (ISSN: 0973-4562), 2014, 9/26, 8948-8951, Annexure-2, Impact Factor=0.13.

23. NRR.Anbusagar, Vijayabasakar, Sengottuvel.P and G, Nagaraj.M. Experimental and Numerical Simulation Studies on the Nano Modified Polyester GFRP Composite Beams. International Journal of Applied Engineering Research (IJER), Research India Publications (RIP), India, (ISSN: 0973-4562), 2014, 9/26, 8905-8907, Annexure-2, Impact Factor=0.13.

24. Muthuraman.V, Ramakrishnan.R, Sengottuvel.P, and Karthikeyan.C. Experimental Study and Optimization of Wire-electrical discharge machined WC-15%Co Metal Matrix composites. Journal of Advanced Material Research, Trans Tech Publication, Switzerland, (ISSN: 1022-6680), 2014, 984-985, 227-232. Annexure-2, Impact Factor=0.14.

25. P.Karunakaran, C.Jegadeesan, C.Rangasami, and Sengottuvel, P., Properties of Silica Sand-Based Castings Prepared with different Proportions of Steel Industry Fly Ash. International Review of Mechanical Engineering (I.RE.M.E), *Praise Worthy prize Publication (UK)*, (ISSN: 1970-8734) 2013, 7/6, 1207-1212. Annexure-2, Impact Factor=0.24.

26. Sengottuvel, P.,Satishkumar, S. and Dinakaran, D., Optimization of Multiple Characteristics Of EDM Parameters Based on Desirability Approach And Fuzzy Modeling. Journal of Procedia Engineering *(Elsevier Publication)*, (ISSN: 1877-7058) 2013, 64, 1069-1078. Annexure-2, Impact Factor=0.22. (Citation: 23).

27. Sengottuvel, P.,Satishkumar, S. and Dinakaran, D., Multi Objective Optimization of Process Parameters During Electrical Discharge Machining of Inconel 718 Using Desirability Approach. International *Journal of Applied Mechanics and Materials*,Transtech Publisher, USA,(ISSN: 1660-9336) 2012, 159, 176-180. Annexure-2, Impact Factor=0.137. (Citation: 1).

28. Sengottuvel, P.,Satishkumar, S. and Dinakaran, D., Multi Objective Optimization Technique for EDM of Inconel 718 Alloy. Manuscript No: CIIT-IJ-2553, *Journal of Artificial Intelligent systems and machine learning,* (ISSN 0974 – 9667 & Online: ISSN 0974 – 9543), 2011, 3, 853-858, Impact Factor=0.763. (Citation: 1).

ii. Principal Investigator

1. Dhanasekar, J., Sengottuvel, P., Designof weighingbased filling system(2017) International Journal of Pure and Applied Mathematics, 116 (14 Special Issue), pp. 81-85.

2. Vijaya, V.G., Dhanasekar, J., Designand fabricationof automatedwork piece countingand sortingusingimageprocessing(2017), International Journal of Pure and Applied Mathematics, 116 (18 Special Issue), pp. 301-305.

3. Dhanasekar, J., Sengottuvel, P., Shapesortingrobot usingimageprocessing.,(2017) International Journal of Pure and Applied Mathematics, 116 (13 Special Issue), pp. 609-614.
4. Dhanasekar, J., Chandran, R. Designand fabricationof six axis robot, (2017) International Journal of Pure and Applied Mathematics, 116 (20 Special Issue), pp. 489-492.

5. Dhanasekar, J., Sengottuvel, P., JaiRajesh, P.Bluetooth controlled5axis articulatedrobot manipulatorwithadaptivegripper(2017) International Journal of Pure and Applied Mathematics, 116 (20 Special Issue), pp. 463-468.
6. Vijaya, V.G., HameedHussain, J., Dhanasekar, J., Designandimplementationof tirepressuremonitoring system, (2017) International Journal of Pure and Applied Mathematics, 116 (14 Special Issue), pp. 75-80.

7. Vijaya, V.G., HameedHussain, J., Dhanasekar, J., Designandimplementationof wheelpressuremonitoring system, (2017) International Journal of Pure and Applied Mathematics, 116 (14 Special Issue), pp. 69-74.

8. Dhanasekar, J., Sengottuvel, P., Rajesh, P., Controlof machines by noninvasivebrainmachineinterface viaelectroencephalography brainmachineinterface(2017) International Journal of Pure and Applied Mathematics, 116 (20 Special Issue), pp. 483-486.

9. JaiRajesh, P., Dhanasekar, J., Vijaya, V.G., Multi-roleunmannedground vehicle forbombdetectionand surveillance,(2017) International Journal of Pure and Applied Mathematics, 116 (14 Special Issue), pp. 31-37.

10. Dhanasekar, J., Sengottuvel, P.,Srikanth, N., Autonomous farmingrobot withplant healthindication,(2017) International Journal of Pure and Applied Mathematics, 116 (20 Special Issue), pp. 457-461.

11. Jai Rajesh, P., Dhanasekar,J., Vijaya, V.G. Helmet fornegligent riders, (2017) International Journal of Pure and Applied Mathematics, 116 (13 Special Issue), pp. 597-601.

12. J. Dhanasekar, Smart Manoeuvring in Mobile Robot for Anti-Personnel IED Detection, *Indian Journal of Science and Technology, ISSN (Print): 0974-6846 & ISSN(Online): 0974-5645, Vol 8(31), IPL0689, November 2015, Scopus Index*

13. Dhanasekar J , Manikandan G , Sridevi S, Bluetooth Control Robot with Position Monitoring System, International Journal of Innovative Research in Science Engineering and Technology, (ISSN(Online): 2319 – 8753& ISSN (Print) :2347 – 6710), Vol. 4, Issue 9, September 2015, Page no. 8373-8378, Impact Factor : 5.442

14. J.Dhanasekar, P.Sengottuvel, G.Manikandan, M. Deepa, Development of a Robotic Arm for Dangerous (Explode) Object Disposal , International Journal of Innovative Research in Science, Engineering and Technology,(ISSN(Online): 2319 – 8753& ISSN (Print) :2347 – 6710) Vol. 4, Issue 6, June 2015, Page no. 4058-4065, Impact Factor : 5.442

15. Manikandan.G, Dhanasekar. J, Sridevi. S, P.Sengottuvel, Dynamic Ball Tracking and Hitting Robot Using Vision System , International Journal of Innovative Research in Science, Engineering and Technology,(ISSN(Online): 2319 – 8753& ISSN (Print) :2347 – 6710) Vol. 4, Issue 7, July 2015, Page no. 6148-6153, Impact Factor : 5.442

16. S.Sridevi, G.Manikandan, J.Dhanasekar, P.Sengottuvel,Bottleneck Analysis of an Automobile Industry Component, International Journal of Innovative Research in Science, Engineering and Technology,(ISSN(Online): 2319 – 8753& ISSN (Print) :2347 – 6710) Vol. 4, Issue 5, May 2015, Page no. 2814-2820, Impact Factor : 5.442

17. Sridevi. S, Dhanasekar. J ,Manikandan. G, A Methodology of Retrofitting for CNC Vertical Milling Machine, International Conference on Robotics, Automation, Control and Embedded Systems – RACE 2015, 18-20 February 2015, Hindustan University, Chennai, India. IEEE Xplore, ISBN: 978–81–925974–3–0. Impact Factor : 2.413

18. Manikandan G, Sridevi S and Dhanasekar J, Vision Based Autonomous Underwater Vehicle for Pipeline Tracking, International Journal of Innovative Research in Science, Engineering and Technology,(ISSN(Online): 2319 – 8753& ISSN (Print) :2347 – 6710) Vol. 4, Issue 1, January 2015,Page no. 18480-18488, Impact Factor : 5.442

19. S.Sridevi, G.Manikandan, J.Dhanasekar, P.Sengottuvel,Design of Fire Fighting Robot, International Journal of Innovative Research in Science, Engineering and Technology,(ISSN(Online): 2319 – 8753& ISSN (Print) :2347 – 6710) Vol. 3, Issue 11, November 2014,Page no. 17141-17144, Impact Factor : 5.442

20. Patel RangamSatishkumar, VeeraAmudhan.R, Dhanasekar.J, "Disaster Management Pick and Place robot" – International Journal of Research in Mechanical Engineering & Technology(IJRMET), ISSN : 2249-5762 (Online) - ISSN : 2249-5770(Print), Vol.3, Issue 2, May-Oct 2013, Impact Factor : 1

21. P. Vinoth Kumar, J. Dhanasekar, Dr.R. Sivaramakrishnan, Dr.K. Kalaichelvan, "Design and Control of Autonomous Underwater Vehicle using Variable Buoyancy System", Digital Signal Processing, Vol 4, No 9, 2012, pp. 219-222

9. Budget

Sl. No.	Equipment	Quantity	Amount in INR
1	A 6 Axis robot	1	70,000
2	Consumables (Like,robot gripper, Controller, etc.)	As per requirement	15,000
3	Travel support for the purpose of research work.	---	5,000
4	Contingency	---	5000
5	Others	---	5000
	Total		1,00,000

10. Name of at least two subject experts from the Institute and one from the outside Institute with their contact details:

a) **Dr.P.Naveenchandran** – Professor, Dept. of Automobile, BIHER, Chennai-600073.

b) **Dr. D. Dinakaran**–Head, Centre for Automation & Robotics, Hindustan Institute of Technology and Science, Chennai- 603103.

CERTIFICATE FROM THE INVESTIGATOR

Project Title: Optimization of Robot Grasping Synthesis

It is certified that

1. I do hereby agree to submit a complete proposal for financial support to the external funding agency within the time period of SMS-2018

2. I undertake that spare time on equipment procured in the project will be made available to other users.

3. I agree to submit a certificate from Institutional Biosafety Committee, if the project involves the utilization of genetically engineered organisms. I also declare that while conducting experiments, the Biosafety Guidelines of Department of Biotechnology, Department of Health Research, GOI would be followed in to.

4. I agree to submit ethical clearance certificate from the concerned ethical committee, if the project involves field trails/experiments/exchange of specimens, human & animal materials etc.

5. I agree to abide by the terms and conditions of SMS-2018, BIHER, and Chennai.

J. Dhaseloor
[DHANASEKAR J]
Name and signature of
Principal Investigator

Name and signature of
Co-Principal Investigator
Dr. P. SENGOTTUVEL,
PROFESSOR & HEAD,
DEPARTMENT OF MECHATRONICS,
BHARATH UNIVERSITY,
CHENNAI-600 073.

Date: 03.10.2018
Place: Chennai - 73

Forwarded by Head of the Department

Signature of the Head
Dr. P. SENGOTTUVEL,
PROFESSOR & HEAD,
DEPARTMENT OF MECHATRONICS,
BHARATH UNIVERSITY,
CHENNAI-600 073.

PROJECT EVALUATION FORMAT

Recommendation Sheet

Name of the Principal Investigator	Mr. J.Dhanasekar
Name of the Co-Investigator	Dr.P.Sengottuvel
Name of the Department	Mechatronics
Title of project	Optimization of Robot Grasping Synthesis
Recommendation of the evaluation committee	Recommended
Financial allocation recommended	Rs. 100000/-

Sl. No.	Equipment	Quantity	Amount in INR
1	A 6 Axis robot	1	70,000
2	Consumables (Like, robot gripper, Controller, etc.)	As per requirement	15,000
3	Travel support for the purpose of research work.	---	5,000
4	Contingency	---	5000
5	Others	---	5000
	Total		1,00,000

Name and Signature of the Research Advisory Committee members with date

(Dr. P. Naveenchandran)