ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 2, Issue 4, pp: (175-179), Month: October - December 2014, Available at: www.researchpublish.com

Solar Powered Stereovision Wireless Robot for Coastal Surveillance

Dheepak Mohanraj[1], Jeby Thomas Jacob[2]

[1,2]Assistant Professors, AMET University, Chennai, India

Abstract: **This paper deals with the study of Coastal ecosystem using surveillance Crab robot. These surveillance robots designed like a crab will be deployed in the area where land meets the sea. The robots will collect the information and send them for analysis. This analysis will help to understand the behavior of coastal specials and their habitat, It also helps to conserve endanger species and prevent their habitat loss. This helps to provide healthy coastal ecosystem which is every vital for global environment.**

Keywords: **Endangered Species, Coastal ecosystem, crab robot. Etc.**

I. INTRODUCTION

An Ecosystem is defined as a natural functional ecological unit comprising of living organisms (biotic environment) and their non-living (abiotic environment) that interact to form a stable self-supporting system. The climate changes due to global warming and marine pollution having caused negative impact on coastal ecosystem and affecting the coastal plants and animal species and other habitats. Due to these factors an unhealthy coastal ecosystem exists and the death of its creatures occurs. It is observed that plastic contributes to the death of 100,000 marine mammals and two thousand sea birds every year.

To protect endangered species several analysis and measure are carried out, one of this is study of coastal ecosystem using autonomous wireless stereovision robot. This robots move around the coastal areas, capture and records the behavior of the species on routine basis, also gives information regarding its habitat and its migrations during day as well as night. This information will be very much useful for understanding and analysis for conserving coastal ecosystem.
Endangered Species in Coastal Ecosystem Surveillance robot serves to Conserving Endangered coastal species
The Autonomous wireless surveillance robot provide following information which helps to save endangered coastal species

- Helps in learning about how interesting and important they are.

The following are the endangered species which will vanish due to habitat loss if proper coastal ecosystem conservation is not done.

- Plants like mangroves, algae, sea grasses and salt marsh etc
- Seabirds like Cormorant, puffin, ospray, kingfisher, pelican, oystercater etc
- Sea animals like sea turtles, sharks, creek crabs, sea snails etc
- Helps in collecting the information which can be used for protect endangered species and its habitat
- Helps in providing information regarding change coastal activities due to marine pollution and global warming
- Helps in reducing rubbish, plastics and other waste disposal near the endangered species habitat.
- Helps in giving information regarding sea erosion and its effect on coastal habitat.

1.1 Various kinds of Surveillance robots

Surveillance robots which can be deployed for safeguarding endanger coastal species .The stereo vision robot can be in various forms like snake ,crab, turtle, spider type robot, nano drone, beach walking robot, beach cleanup robot, wave glidder or a normal wheeled robot which is suitable for beach terrain.

II. DIFFICULTIES AND CHALLENGES IN DESIGNING SURVEILLANCE ROBOT

As the environment becomes less structured or the interactions between machine and environment become more complex, we understand less about what we are doing. Examples of such applications include autonomous reconnaissance in unstructured terrains, excavation in mining or construction, sub-sea navigation and low altitude UAVs.The most complex and demanding research issue facing in the field of surveillance robotics are 3D perception and understanding of typical unstructured environments .This may include the problem of land-vehicle terrain estimation from sensors such as vision and lasers or equivalent problems with sonar surveillance and with airborne laser and radar systems. Complex terrain model monitoring is an essential component of function such as navigation ,path and mission planning in unstructured domains .While there is ,and has been a great deal of research currently being undertaken in these areas .The reliable construction and understanding of the terrain models is still some way off. This is for two main reasons. Primarily we need a general representation of such environments capable of dealing with the intrinsic uncertainty like location structure and data association together with the broad unpredictable, time varying multi structured types of terrain likely to be encountered by the field of robotic machines. A number of terrain construction methods have been used with different degrees of freedom. These include grid, triangular tessellation and probabilistic methods .Secondarily the problem of terrain understanding remains a major hole in current research effort. Terrain understanding really involves the manipulation, reasoning and dynamic use of terrain models in navigation and planning.

III. PROPOSED CONCEPT OF COASTAL SURVEILLANCE CRAB ROBOT DESIGN

The concept of robotic crabs are developed as a result of continuous explorations in the area of coastal surveillance ,one of the main necessity of a coastal surveillance robot is the endangering species in the coastal region and also the sediment deposits in the coast regions which will help in the geological studies. Continuous monitoring unmanned and coastal area will help in the scientific researches.

The major challenge in the coastal surveillance was the construction of the robots. The wheeled robots don't help the surveillance model due to wet sand and unexpected obstacles which in turn will make it upside down or malfunctioning.

Mechanical structure of the Crab Robot

The proposed structure of crab robot (CR) is shown in figure the major feature of the robot are

a) Self Solar powered structure for long surveilling period

b) Ad hoc network supporting architecture (RF communication)

c) GPS system for location tracking

d) Stereo vision camera

e) Stepping motor for variable speed operation f) obstacle sensing antenna for long range obstacle sensing

g) Power full DSP processor for image processing and video transmitting to the base stations

h) Power full lithium ion battery.

The robot will be able to move in accordance with the base station's control signal. The high precision stereo vision camera with infra red vision can help the nocturnal marine living beings to be surveyed.

If the Base station controller wants to focus any particular instant or place. It can be done with the help of remote motion controlling capability of the Crab robot powered by Ad –Hoc network

ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 2, Issue 4, pp: (175-179), Month: October - December 2014, Available at: www.researchpublish.com

3.1Communication Topology

An ad-hoc network communication system based on the mobile robots as communication nodes is deemed suitable because it can offer a robust communication infrastructure. In this paper we use a mobile ad-hoc network being able to be used in marine coastal region. The network has to support the surveillance perspective of the robotic crabs .The network will be assisting a group of robots with a communication infrastructure as well as position data. One of the most important features of the network is its robustness in terms of available communication links and position data to maximize the surveillance region,

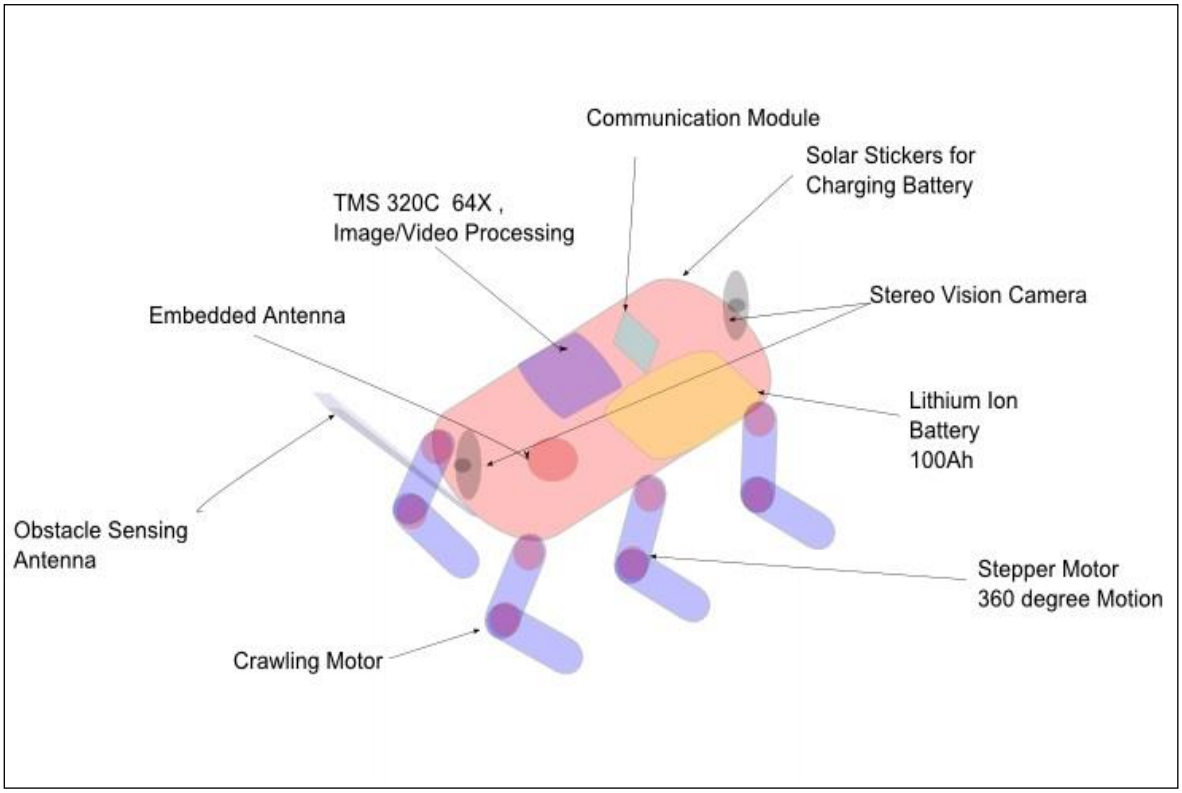

Fig.1 Proposed marine crab robot

For the proper co ordination among the crab robots in marine coastal environment a set of swarming algorithms related to the distribution of robots in the site has been developed

The main goal of the dynamic triangulation method is to deploy robots on the site in such a way as to provide its largest coverage. The robots should also be deployed in a sensible manner in order to facilitate communication and exploration of the environment. The dynamic triangulation method should provide, for example, positioning of beacons used as reference points at the vertices of equilateral or nearly equilateral triangles. As the geometry of the environment might be very complex, some robots can be placed as beacons at the openings, which might be marine shrubs, Wood poles, include the corners of obstacles. Other robots might be distributed as uniformly as possible in order to gather reliable information about the environment. The robots will form a partition of the environment, separating it in regions, which will represent a triangulation in the absence of obstacles. This partition should adjustable due to the movements of the robots, to accommodate the appearance of new robots, or the loss of some robots, and to reflect the exchange of the roles between mobile robots and beacons

The fulfillment of the method represents a challenge for the design of swarming algorithms as the dynamic triangulation is a complex behavior that has to emerge from relatively simple behaviors. The method will also incorporate both non communicative and communicative swarm modes. The method will develop a new self-organizing system, which will be a hybrid of a (heterogeneous) swarm, and a mobile ad-hoc network

ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 2, Issue 4, pp: (175-179), Month: October - December 2014, Available at: www.researchpublish.com

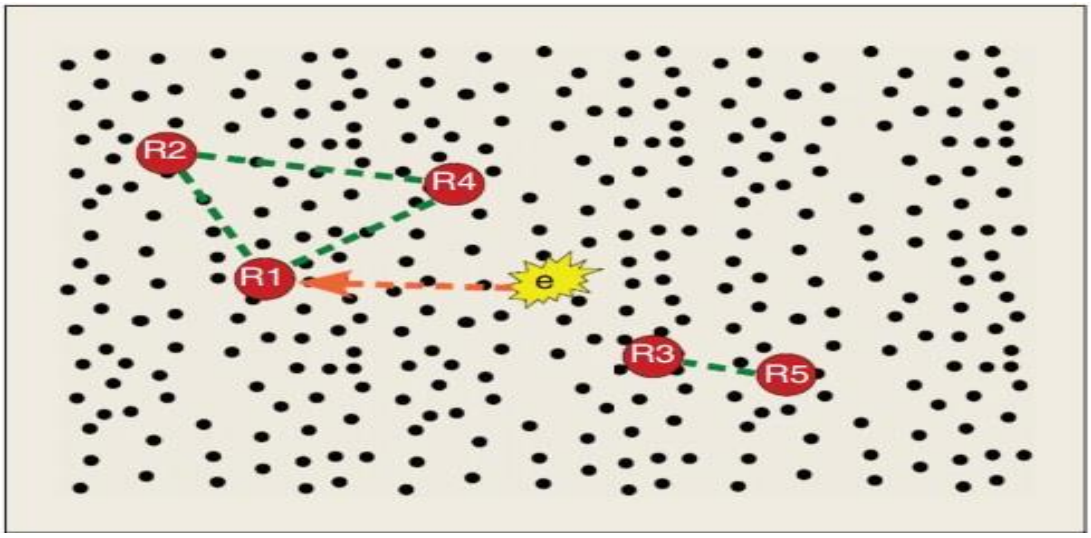

Fig.2 The triangulation method of networked robots

IV. FUNCTIONAL EXPLANATION

The Block schematic of the crab robot is shown in figure in this the dsp controller of TMS 320c 64 x family microcontrollers is used for the image processing and communication with the base station using the RF module. The locomotion movement is also done by DSP controller. Stepper motor used for this Robot will engage the robotic arms in 360 degres.It are designed in such a way that the single arm of the robot is able to lift the total weight of the system. Thus the accidents and unexpected obstacle can be easily overcome by the crab

Serial No	Device Specification	Rating	Nos
1	Stereo vision Camera	e-Cam_9v024,30fps	2
2	Bipolar Stepper motors	12v,8kgf.cm	8
3	RF Transmitter/Receiver	315/433 MHz	1
4	Battery, Lithium ion	12v,50Ah	1
5	Infra Red Sensor	38Khz	2
6	Solar Panel	Sticker Type, 80 Watt	-

Fig.3 Specification of the hardware used in Crab robot

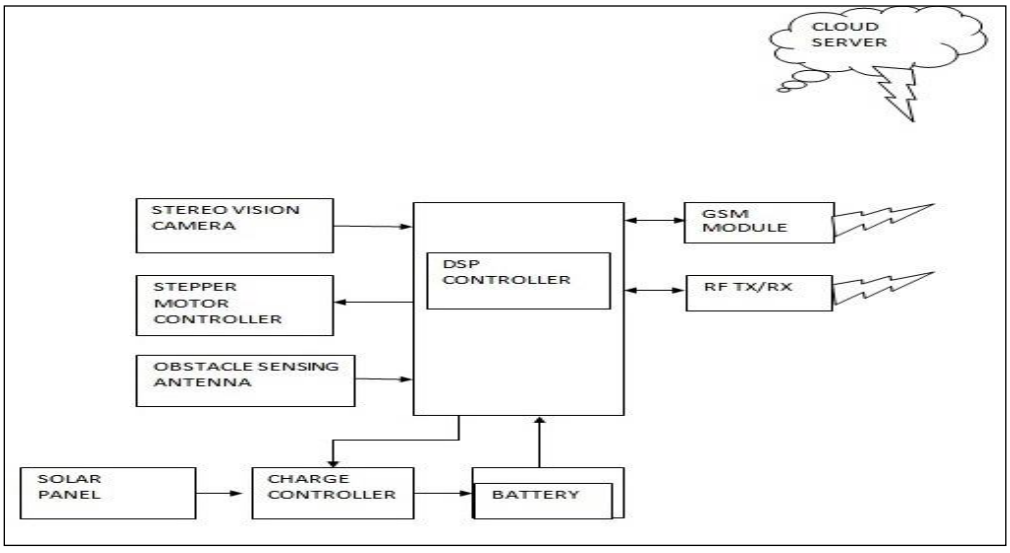

Fig.4 Block Schematic of the working scheme

V. CONCLUSION

The design of the novel concept of Crab Robot for Marine coastal surveillance is done overcoming the drawbacks of the conventional remote controlled surveillance robots. The Robots works under particle swarm logic in an Ad hoc network which helps to concentrate the area of interest by the remote controller at a particular spot by different robots. The crab robots move in a fail safe manner and are also tracked by GPS. The data transferring is done through RF frequency signals.

REFERENCES

[1] Marine and Coastal Protected Areas , A Guide for Planners and Managers ,Third Edition by Rodney V. Salm and John R. Clark with Erkki Siirila International Union for Conservation of Nature and Natural Resources.

[2] Marine Bird Disease and Health Marine Bird Disease and Health Surveillance Program in Coastal Surveillance Program in Coastal by Terry M. Norton, DVM, Sea ecological assessment network

[3] Clark, W.G. 1990. Groundfish exploitation rates based on life history parameters. Canadian Journal of Fisheries and Aquatic Science 48: 734–750.

[4] Cochrane, K.L., ed. 2002. A fishery manager's guidebook: management measures and their applications. FAO Fisheries Technical Paper No. 424. Rome. 213 pp.

[5] Cochrane, K.L. 2006. Marine Protected Areas as Management Measures: Tools or Toys? In Law, Science, and Ocean Management. Proc. 30th Annual Conference of the Center for Oceans Law and Policy, Dublin, Ireland, July 2006

[6] Curtis, R.E. & McConnell, K.E. 2004. Incorporating information and expectations in fishermen's spatial decisions. Marine Resource Economics19: 131–143

[7] FAO Technical guidelines for responsible fisheries management, Marine protected areas by food and agriculture organization of the United Nations, Rome 2011.