Proposing SPM$_i$M$_o$S – Special Purpose Military Mobile Service using Night Vision Technology

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ABSTRACT

The use of night vision equipment's is going to be more popular because of the number of terrorist attacks at border areas are increases day by day. In this paper, authors designed a new methodology named SPM$_I$M$_O$S (Special Purpose Military Mobile Service) whose main purpose is to provide remote interactions between soldier and MRA (Military Robot Assistant).This new designed methodology SPM$_I$M$_O$S uses IR (Infra-red) Security Camera whose function is to improve the clarity of data capturing at low light conditions or no light conditions during night time surveillance. The major objective of this research paper is to collect information from border areas especially when the situations are abnormal or in other words you may say during critical time through MRA'S (Military Robot Assistants). This proposed methodology save human life, time as well as energy. As the maximum use of MRA'S (Military Robot Assistant) automatically reducing the risk of terrorist attacks. And the other major benefit is technology also helps to contribute with Indian army and save our Indian Heritage (that is Indian People). This new designed methodology is working on the basis of two steps. At first step, MRA (Military Robot Assistant) capture images at low light conditions (no light conditions) by utilizing Infrared Secure Camera Technology after its activation by his master (who is anybody say, soldier). In the second step, the complete record of captured information will forward/send into the main screen of soldier by the MRA (who is slave). In the absence of interface (i.e. SPM$_I$M$_O$S), the interaction between human (Soldier) and MRA (Slave) is not possible.

Keywords

Military Robot Assistant (MRA), Night Vision Technology, Infrared Security Camera, Interface, Camera Technology, Remote Interactions

General Terms

Human (Soldier)

1. INTRODUCTION

As terrorist attacks [8] [39] are increases day by day so to provide security at border areas to Indian heritage is a global security issue. As per results collected by the authors, they concluded most of the terrorists attacks are planned at night and executed on day time especially in crowded areas via border areas. So they decided security at low light or no light that is at night time is a big critical issue and researchers has need to design some new ideas those will further help to design some new technologies or mechanisms based on night vision technologies so that in future the growth of attack or the level of risk will be reduced up to some extent and the safety factor will be increased at night time. Presently, they

may utilize several different security mechanisms whose work like a manner or named them as night vision equipment's. The design of night vision equipment's is as small as possible but having good data capturing power at low light conditions or no light conditions especially in foggy and rainy weather. The main motive to design such types of equipment is to provide the facility of real time data monitoring as an example planning of terrorist attacks will be early detectable so that before launching of their attacks Indian army will contribute their power for stopping these attacks and saves humans life. The main important key parameter while designing night vision technology device is to provide high level of image capturing power especially in darkness. As studied by authors in literature survey, due to lack of tapetum lucidum [6] [14] human eye is unable to see at night time/low light conditions [6] so Indian army has need to utilize night vision cameras and some other night vision devices for capturing terrorist information. Currently, there are two types of night visions are available viz. biological night vision, technical night vision. The function of biological night vision is to change the shape of eye. And the function of technical night vision uses image intensification and thermal imaging collectively [9] [27]. Type of night vision device decides a method embedded on it. So, for providing night time surveillance at border areas they may use several different methods as an example they may use spy robots [44][39] for handling critical situations especially for real time monitoring, by putting eye drops on army that provide a temporary vision in darkness/ at low light condition[16] and another method sometimes they may use separate night vision [28] technology devices for public safety as like night vision goggles [41][11], night vision camera[33][47] and spy robot [44] [39] etc where the cost of spy robot [44][39] is high as compare to night vision technology devices so Indian Army prefer different night vision technology devices during night vision surveillance depend on the requirements and time accordingly. In general, the night vision technology [41] has basic four components that are named as object lens, power supply, eye piece and image intensifier tube [17]. The major objective to utilize night vision device in this paper is to provide good visibility in darkness even whatever the weather is viz. foggy or rainy [9] sometimes it may give low performance as low quality material used in it. So, to overcome such types of problems researchers suggests designers have need to design a tera hertz wave whose range lies between infrared and microwave radiation that ultimately provide most difficult mode of light detection [18]. The basic design of night vision device use millions of hair fine fibers of optic glass with gallium arsenide or phosphorus [12]. The popularity of phosphorus is its green color that is more sensitive to human eye [11] [22]. Due to its sensitivity [24] feature it may lead further for bright future

[25]. Actually, night vision is a global security challenge[30] so authors did survey, in our daily life Indian army use IR Security camera [33][47] for providing safety to the public or Indian Heritage due to its some additional features as like good mounting features,360 degree plan(that is OMNIDIRECTIONAL[10] CAMERA),fully marine construction[46] and high level of quality of image capturing etc where the quality of image is only depend on the size and type of lens [45] used, type of camera transfer technology service [40] is used, use of laser technology and use of fiber optic technology [32] etc. The complete working is depend upon bi-directional algorithm is used with size [42] that further helps to produce a qualitative image [31]. The significance to use IR(Infra-Red) security camera is it has high ability to capture videos at low light conditions [6] and the other most important benefit is it provides an easy method for performance evaluation by simply utilizing the concept of thermal imaging that further provide different results at different temperature ranges [15] with different-2 body sizes [47]. Due to availability of most interesting features of night vision technology devices it will become more popular now a days and even uses in many real life applications as an example remote surveillance of wild life[34][26],US military most preferably utilizes solar panels[20] and for tackling emergencies at hard time they prefer to use spy robot [44][39] as an example HEMS(Hospital Emergency Medical Services) that provide more benefit for air ambulance programs in air planes[29],manufacturers implemented night vision technology in front head lights of automobiles say in BMW that utilizes ADAS(Advance Mobile Assistance Camera)[43][37] for reducing the accident rate at low light[6] that ultimately improve vehicle as well as human safety. Along the other side, there are two separate modes of IR'S are used in automobiles for improving visibility of human at night time viz. NIR(Near Infrared) and FIR(Far Infrared). Each mode has own separate features like when manufacturers implement NIR in automobiles then it provide visibility of user about near visible light and in case of FIR it helps to detect range farther than IR Band[13][19].

This paper presents a new designed methodology named "SPM$_I$M$_O$S" that is named as Special Purpose Military Mobile Service whose purpose is to provide security to public at low light conditions/or no light conditions especially nearby border areas by utilizing Infrared security camera through remote interactions. The major objective of this new designed methodology is to reduce the rate of terrorist attacks in darkness that automatically increases public safety. SPM$_I$M$_O$S is act as interface between the soldiers and MRA (Military Robot Assistant). In the absence of the interface [SPM$_I$M$_O$ (Special Purpose Military Mobile)], the interaction between soldiers and MRA is not possible. The function of MRA is to capture images by using IR security camera during low light conditions and after that send/forward that captured data to soldier main screen by utilizing remote interactions that are used in SPM$_I$M$_O$S (Special Purpose Military Mobile Service). By utilizing this new designed methodology, authors said the growth rate of terrorist attack will be decrease up to some extent because of real time monitoring images are primarily captured and forwarded by MRA and hard situations will be easily handled in advance. MRA utilizes remote interactions for sending information from border area to soldier regions that is on the main screen. The IR security camera supports a long range of region due to its omnidirectional feature [10]. After surveillance through IR camera by utilizing remote interactions soldiers will send captured information to the main screen continuously and in future they will take actions based on captured information on border areas. In this way, Indian army provides safety to public within short interval of time by generating prior security alerts through SPM$_I$M$_O$S (Special Purpose Military Mobile Service) through remote interactions.

2. REVIEW OF LITERATURE

(Rimmy Chuchra & Ramandeep Kaur et al Feb-2013) This paper discussed about the joint action taken by the humans and robotics for performing any task. Humans and robotics holds master/slave relationship where interface is act as a sandwich between the humans and robotics. The use of interface is to provide communication between human and robotics in natural way where human acts as a master and is responsible for giving instructions to robotics and robotics always acts as a slave that work as per instructions given by their master. The communication flow methodology between human and robotics can be shown in fig.1: [2]
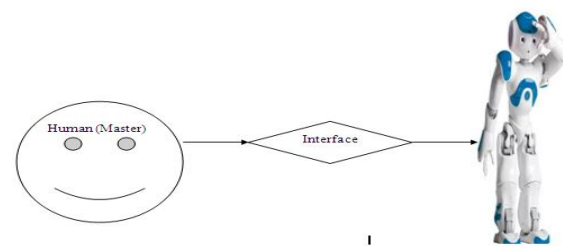

Fig.1: HRI: Shows Master/Slave Relationship

(Rimmy Chuchra & R.K Seth et al May-June 2014): Authors had been proposed a new procedure termed as "Human-robotics Interaction based analysis-Using data mining techniques" that shows how humans and robotics performed any task collectively by utilizing three different data mining techniques viz. classification, regression analysis and time series analysis. This designed methodology worked only with single type of data input format. It must be in discontinuous form (i.e. - in digital form). Theoretical and experimental based analysis investigated in this paper with significant results. [1]

(R.K Seth & Rimmy Chuchra et al Jan 2015): Authors had designed a new communication flow methodology that works on two separate types of inputs given by the user viz. analog and digital form. The designed methodology also provides more natural way of communication while utilizing interface. Instructions can be easily managed by robotics given by the master-human. [3]

(Rimmy Chuchra & R.K Seth et al April 2016): This paper presents the synergetic interaction between man and machine having master-slave relationship where a man act as a master and nano-robot act as slave. Here, nano-robot uses sixth sense technology device for mind mapping of idea by utilizing blue brain with swarm intelligence. The major benefit to use sixth sense technology device by nano-robot is to provide protection of human body from the radiations emitted by it. The collaboration between man and machine intelligence leads to achieve a smart or intelligent joint action for developing projects in any industry or daily life works. [4]

(Rimmy Chuchra & R.K Seth et al December 2015): In this paper, authors proposed a new methodology FPMS that is termed as Faculty Performance Metric Scale whose purpose is to improve the overall quality of existing education systems by utilizing the application of ambient intelligence. The

working of designed methodology is based on the mutual interaction between human and service robot where human act as a master and service robot act as a slave. The main function of service robotics is to store and monitor the faculty members during delivery of the lectures. The collaboration between human and service robotics leads to achieve a joint action and shows active team work participation by utilizing natural interactions. This paper also discusses about the current scenario that are to be followed by on-going universities and after that authors compares the current scenario with the proposed scenario that ultimately find qualitative results in future.[5]

3. RESEARCH DESIGN
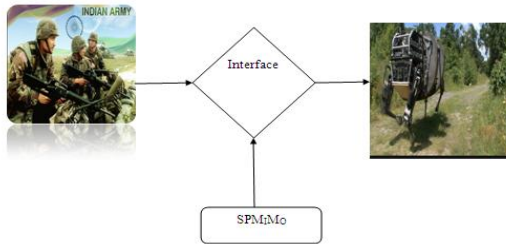
Fig. 2: Communication between Soldiers and MRA(Military Robot Assistant)

4. COMMUNICATION FLOW METHODOLOGY
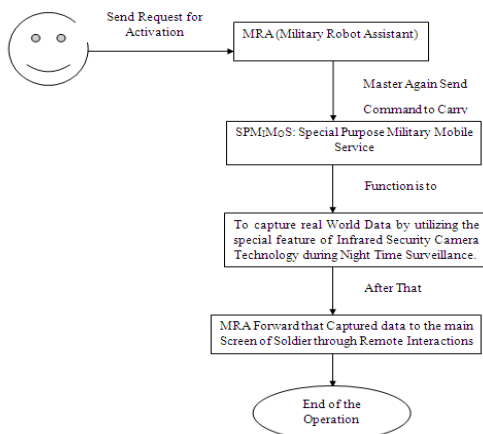
Fig. 3: Interaction between MRA and Soldier

5. WORKING

The interface as shown in figure.3 as a sandwich between soldier and MRA (Mobile Robot Assistant) having master-slave relationship where soldier act as a master and MRA act as a slave. At First, soldier send request to MRA for its activation. Once MRA will be activated then move to next step. In second step, master send command to MRA to carry SPMIMO whose function is to capture data/images from the real world at low light conditions (or no light conditions that cannot be seen by the human eye). In the third step, after capturing data from low light conditions, MRA will forward the captured information to the main screen of soldiers of Indian army through remote interactions. And finally action or decision will be taken on the basis of printed picture on the screen. In this way, this new designed methodology provides a facility of real time monitoring and helps for supervisors to take an immediate decision under critical situations.

6. CONCLUSIONS

This paper discussed about different types of night vision technologies along with its working and proposed a new communication flow methodology that shows the interaction between soldier and Military Robot Assistant (MRA) by utilizing SPM_IM_OS (Special Purpose Military Mobile Service). MRA complete own task in two steps through remote interactions after its activation by his master soldier (i.e. who is human). In the absence of interface (i.e. SPM_IM_OS), interaction will not be possible between soldier and MRA. The main purpose to design a new methodology is to enhance human life safety and reduce the risk of terrorist attacks especially on border areas. Ultimately, this proposed methodology also helps us to save man power as well as energy of Indian memory.

7. FUTURE SCOPE

In future, this work will be extended by adding some more features like functional requirements on MRA where MRA is collaborated with spy robots [39][44] and work like a team. When soldier give command on MRA'S through remote interaction then it will take a joint action with other spy robots [39] [44] for tackling emergency situations say on the time of war especially it plays an important role.

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