International Journal of Scientific and Technical Advancements
IJSTA
ISSN: 2454-1532

Proposed Model of Future Battle Suit Helmet

Rishab Kaw [1], Neeraj Tripathi [2]
[1, 2]DoECE, SMVDU, Katra, J & K, INDIA-182320
Email address: [1]2013eec36@smvdu.ac.in, [2]neeraj.tripathi@smvdu.ac.in

***Abstract*—** Technology application to the soldier platform is very important because combat success in future battles will require information dominance and speed of action from the highest levels of command down to the individual soldier as critical components. This proposed model of the future battle suit will use cutting edge technology to create a more effective soldier. Providing the soldiers with a capable fighting system – a battle suit will be worth the effort and will result in advancements that will revolutionize warfare at the individual and small-unit level. The goal of this effort is to provide the future soldier with non-invasive technological upgrades to increase its performance on the battlefield. This paper explains the proposed helmet module of the future battle suit.

***Keywords*—** Future battle suit, Soldier system, Helmet HUD

I. INTRODUCTION

A soldier is a professional fighter, a man or woman who is paid to fight for a country or a cause. Information dominance and speed of action from the highest levels of command down to the individual soldier will be critical components of combat success in future battles, therefore technology application to the soldier platform is very important. For the soldier platform to achieve optimum effectiveness, the soldier – human system requires technologies that maximize its performance.

A simple requirement analysis for a future battle suit results in basic requirements to protect, sustain and enhance the performance of individual soldiers while allowing them to function efficiently in environmental extremes (heat and cold) and survive combat threats (ballistic, sensors and LASERs). This requires the replacement or elimination of currently worn or carried items with modernized hardware and software that provide increased capability and functionality.

It is, however, difficult to make a future battle suit when placed within the reality of weight, space, power and balance constraints of the soldier platform. The challenge is to properly equip a trained soldier with the clothing and items necessary to provide protection from the operational, mission, and environmental extremes while providing enhanced lethality and connectivity on the battlefield. Another challenge is the integration of technologies onto the soldier platform as a total system. The solution is the application of soldier technology by treating the soldier as a system. This approach is beneficial technologically because the effectiveness of a well-managed system is magnified when each of its functional components is systematically integrated into an interrelated unit.

This proposed model of the future battle suit will use cutting edge technology to create a more effective soldier. It will provide soldiers with a tightly integrated system of systems that will yield revolutionary enhancements in terms of individual survivability, lethality, mobility, sustainability and situational understanding. He will be aware of everything around him and will have improved protection, firepower, and military intelligence.

Providing the soldiers with a capable fighting system – a battle suit will be worth the effort and will result in advancements that will revolutionize warfare at the individual and small-unit level. The goal of this effort is to provide the future soldier with non-invasive technological upgrades to increase its performance on the battlefield. This paper explains the proposed helmet module of the future battle suit.

II. HELMET HARDWARE

Fig. 1. Helmet hardware.

In the case of a soldier, weight is a critical aspect. Total weight of the helmet cannot be increased due to adverse effects on mobility and fightability. The future battle suit's helmet will be lightweight and will feature a specially developed visor to protect his face, eyes, and ears against ballistic, energy and acoustic threats. It will attach to the battle suit with an airtight seal. The design of helmet must be so that it is lightweight as well as strong so that it doesn't affect neck movement and mobility. It will be made from Kevlar – a synthetic fiber that is five times stronger than the same weight of steel [1]. The specially developed visor will provide eye protection from LASER threats as it will be made from frequency agile non-linear optical materials [2]. The helmet will be made according to individual soldier's measurements and age of one size fits all (small, medium and large sizes) will be over.

Rishab Kaw and Neeraj Tripathi, "Proposed model of future battle suit helmet," *International Journal of Scientific and Technical Advancements*, Volume 2, Issue 4, pp. 115-118, 2016.

The helmet's HUD (Heads Up Display) will enable the display of tactical, positional and situational data, mapping icons, contaminated areas, minefields and a variety of other essential information on the helmet's visor [3-5]. There will be an air filtration system will provide protection against CB (Chemical-Biological) threats. Physiological sensors will be added to access physical fatigue, total weight, hydration status, and blood oxygen levels [6, 7]. These sensors are placed in the suit and process biological signals into useful information. It will have an antenna for connecting to a secure mobile internet to provide and obtain critical battlefield information and to maintain a full-time link to all available battlefield assets [8]. The helmet will include Global positioning system (GPS) antenna to provide precise location information [9].

It will have sensors for wall penetrating RADAR, cameras for long-range sight, night vision and thermal vision. It will include a 360º camera array so that the soldier has 360º awareness of his environment. All these cameras and sensors will relay useful sight to the helmet's HUD.

III. HUD Features

- The HUD's OS (Operating System) will be cognitively engineered and will provide hands-free operation of HUD. Eye tracking systems [12], voice controls and BCI (Brain Computer Interface) technologies [13] will be used for interfacing with the HUD's OS.
- The HUD will provide 360º vision to the soldier for real-time awareness of both friendly and enemy situations [10]. Its integrated 360º combat system will enhance friend or foe identification and will aid in reducing fratricide.
- The information from sensors and cameras (Thermal vision, Night vision/low-light vision, Wall penetrating radar [11], Long range sight camera) will provide soldiers with super-human enhancements. This advanced suite of sensors and information technology systems will allow the soldier to successfully identify and engage targets at ranges in excess of 100 meters with an extremely high degree of precision and will provide enhancements in mine detection and avoidance capability.
- The helmet's HUD will interface with the soldier's weapon system through a wireless communication system that will deliver weapon-eyepiece sensor's real-time visual data to the helmet's visor. This will exponentially increase weapon's ease of use.
- HUD's OS will provide targeting interpolation capabilities to identify, range and prioritize targets and will deliver firing solutions for small, distant and moving targets.
- The smart navigational software will automatically select the optimal route, predict enemy movements and counter-manoeuvres and precisely synchronize troop movements. It will provide every soldier with the ability to precisely know where he is located and where other members of his squad are located.
- The suite of camera sensors will enable real-time video capture and streaming capability that will ensure the battle commanders at base stations have the information necessary to guarantee their soldiers are operating at peak performance.
- The HUD allows visual augmentation technology [4] to provide a level of data selected for each soldier that displays a congruent picture of the battlefield. In addition, it will communicate battle-planning and strategies from the commanders at the base station and will compute useful information via complete sensor fusion.
- The HUD's OS provides the soldier with both short-range and long-range communication capabilities. A soldier needs to keep in regular contact with his fellow soldiers and with his base in order to receive orders and signals and pass on important information. He needs good intelligence about the enemy; their location, strength, capabilities, and intentions. Without such intelligence, he would be operating blind and could put the lives of himself and others at risk.
- The HUD's OS will use data from all sensors and employ big-data analytics for continuous environment monitoring.
- The HUD will employ advanced display technology capable of Augmented Reality implementation [4].
- OS on the helmet will be able to provide status and monitoring of every resource that's available in the battle suit.
- The OS will be able to conduct real-time interactive reviews of health. Data from sensors will provide information on energy expenditure, thermal status and alertness level of soldier.
- OS will relay health information to the base station. Knowledge of soldier's physiological status and predicted performance capacity will furnish commanders with a means to instantly access the physical and cognitive competency levels of their force. This type of information will aid in assessing operational risk as well as planning logistical support. When this knowledge is coupled with strategies to restore and maintain maximal performance, commanders will possess a powerful force maintainer.

IV. Status Information Available on HUD

The following status information will be available as status icons inside HUD at their appropriate positions in placement regions of HUD.

- Battle suit's climate status and control.
- Continuous soldier's health status monitoring.
- Weapon system and ammunition - status and availability.
- Communication links with team members, base station, and battlefield assets.
- Combat System - Friend or foe recognition.
- Continuous environment monitoring
- Suit's energy levels.
- GPS or map guidance system display.
- Battle suit attachment controls (Exo-skeleton, Airborne parachutes, Micro-drones, Weapon systems).

Rishab Kaw and Neeraj Tripathi, "Proposed model of future battle suit helmet," *International Journal of Scientific and Technical Advancements*, Volume 2, Issue 4, pp. 115-118, 2016.

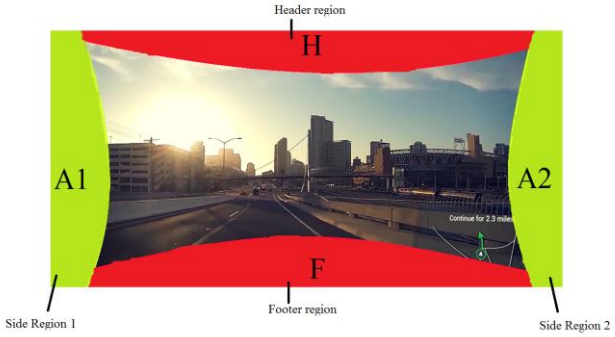

Fig. 2. Placement regions for status information inside HUD

V. CONCLUSION

Technology application to the soldier platform is very important because combat success in future battles will require information dominance and speed of action from the highest levels of command down to the individual soldier as critical components. The goal of this effort is to provide the future soldier with non-invasive technological upgrades to increase its performance on the battlefield. Various features of the Helmet HUD's OS and its hardware have been explored.

ACKNOWLEDGMENT

The authors want to thank Vice Chancellor SMVDU, Prof. Sanjeev Jain for encouragement and support to carry out this work and permission to publish it.

REFERENCES

[1] C.Y. Tham, V.B.C. Tan, and H.P. Lee, "Ballistic impact of a KEVLAR® helmet: Experiment and simulations," *International Journal of Impact Engineering*, vol. 35, issue 5, pp. 304-318, 2008.

[2] W. Cai, U. K. Chettiar, A. V. Kildishev, and V. M. Shalaev, "Optical cloaking with metamaterials," Nature Photonics, 1.4, pp. 224-227, 2007.

[3] R. Muruganandam, "Heads up display," SAE Technical Paper 2007-01-3521, 2007.

[4] T. P. Caudell and D. W. Mizell, "Augmented reality: an application of heads-up display technology to manual manufacturing processes," System Sciences, 1992. *Proceedings of the Twenty-Fifth Hawaii International Conference on*, Kauai, HI, vol. 2, pp. 659-669, 1992.

[5] Reitmayr, Gerhard, and D. Schmalstieg, "Collaborative augmented reality for outdoor navigation and information browsing," 2004.

[6] Grayson, AC Richards, Rebecca S. Shawgo, Audrey M. Johnson, Nolan T. Flynn, Yawen Li, Michael J. Cima, and Robert Langer, "A BioMEMS review: MEMS technology for physiologically integrated devices," *Proceedings of the IEEE*, vol. 92, no. 1, pp. 6-21, 2004.

[7] A. Sadat, H. Qu, Chuanzhao Yu, J. S. Yuan, and H. Xie, "Low-power CMOS wireless MEMS motion sensor for physiological activity monitoring," in *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 52, no. 12, pp. 2539-2551, Dec. 2005.

[8] Singh, Indrasen, and Dr V. S. Tripathi, "Micro strip patch antenna and its applications: a survey," *Int. J. Comp. Tech. Appl.* 2, no. 5, pp. 1595-1599, 2011.

[9] X.-F. Peng, S.-S. Zhong, S.-Q. Xu, and Q. Wu. "Compact dual-band GPS microstrip antenna," *Microwave and Optical Technology Letters*, vol. 44, no. 1, pp. 58-61, 2005.

[10] G. Scotti, L. Marcenaro, C. Coelho, F. Selvaggi, and C. S. Regazzoni, "Dual camera intelligent sensor for high definition 360 degrees surveillance," *IEE Proceedings-Vision, Image and Signal Processing*, vol. 152, no. 2, pp. 250-257, 2005.

[11] M. Antoniou, V. Sizov, C. Hu, P. Jancovic, R. Abdullah, N. E. A. Rashid, and M. Cherniakov, "The concept of a forward scattering micro-sensors radar network for situational awareness," In *2008 International Conference on Radar*, 2008.

[12] R. J. Jacob and K. S. Karn, "Eye tracking in human-computer interaction and usability research: Ready to deliver the promises," *Mind*, vol. 2, no. 3, 4, 2003.

[13] G. Schalk, D. J. McFarland, T. Hinterberger, N. Birbaumer, and J. R. Wolpaw, "BCI2000: A general-purpose brain-computer interface (BCI) system," *IEEE Transactions on Biomedical Engineering*, vol. 51, no. 6, pp. 1034-1043, 2004.

Rishab Kaw and Neeraj Tripathi, "Proposed model of future battle suit helmet," *International Journal of Scientific and Technical Advancements*, Volume 2, Issue 4, pp. 115-118, 2016.

ISSN: 2454-1532

Rishab Kaw and Neeraj Tripathi, "Proposed model of future battle suit helmet," *International Journal of Scientific and Technical Advancements*, Volume 2, Issue 4, pp. 115-118, 2016.