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# Remote-controlled Beetles and Birds with MUSE-2 EEG Sensors For Remote Healthcare

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**Abstract:** A micro-version of MUSE-2 can be installed on a remote-controlled beetle or other migrating birds to monitor the mental state of victims in earthquake/disaster/remote areas. This can also be used in other dangerous/disastrous environments and treat remote patients in areas where medical professionals are not available. A unique feature of this research is the installation of MUSE-2 electrodes on a remote-controlled beetle, bird and AIB (Artificial Intelligence Bird) to check the victim's condition in remote areas and report the results to medical professionals to treat/rescue people in remote areas.

## I. INTRODUCTION

Mind [1][2], as an algorithm based on EEG (ElectroEncephaloGram) data generated in MGBA (Microbiome-Gut-Brain-Axis), affects peace of mind, stress, life quality, longevity and diseases. The fact that every human has a unique personality (unique mind), determined by 8 stages of life [3][4], may lead to humans having difference of opinion. However, when humans are in life threatening environments, such as earthquakes and disasters caused by weather or other factors, rescue efforts are challenging and needed for all humans including those in remote locations.

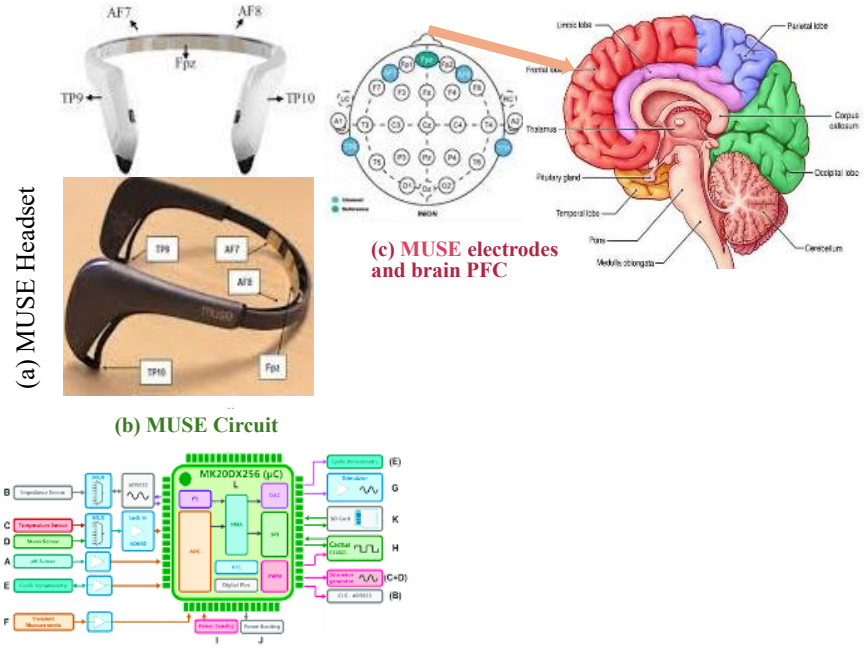


**Fig. 1** MUSE details; (a) Headset, (b) MUSE circuit, (c) MUSE electrodes, brain details and electrode positions.

Ultra-lightweight cyborg with remote-controlled living beetle, carrying a miniature backpack, has been reported [5] in addition to an earlier report [6]. EMG (Electro Myo Gram) signals have been measured on beetle legs [5][7]. As seen in Fig. 1, using a similar technique EEG signal from a human brain can be detected by sensors on beetle legs touching the human forehead. Such signals can then be transferred to a remote (a) medical specialist and (b) AI (Artificial Intelligence) specialist.

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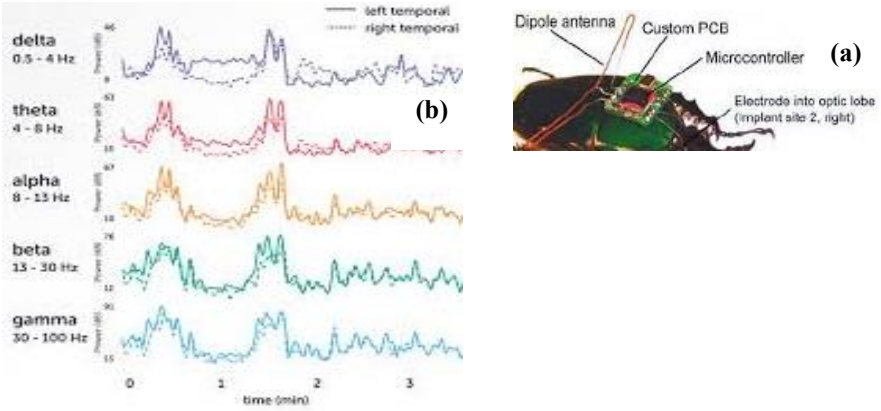


**Fig. 2** (a) Cyborg insect carrying electronic system and (b) brainwaves measured on a human.

Fig. 2 shows (a) Cyborg [8] insect carrying electronic system and (b) brainwaves measured on a human. Such a system has been made for use in a disaster area to rescue humans. This paper shows that this concept can be used to treat humans in areas where no medical professionals are available. A unique feature of this research, as shown in Fig. 3, is the installation of MUSE-2 electrodes on a remote-controlled beetle to check the victim's condition in remote areas and report the results to a medical professional to treat and rescue people in remote areas.

## II. BEETLE WITH MICRO-MUSE WITH EEG MICROELECTRODES

A micro-MUSE-version on beetle's back and EEG electrodes installed on its legs can help check the disaster victim's condition as well as remote patients' health. The remote medical professional equipped with AI (Artificial Intelligence) system can check/rescue/treat people in need. Fig. 3 shows beetle's 6 legs, used as MUSE-2 sensor electrodes, controlled remotely.

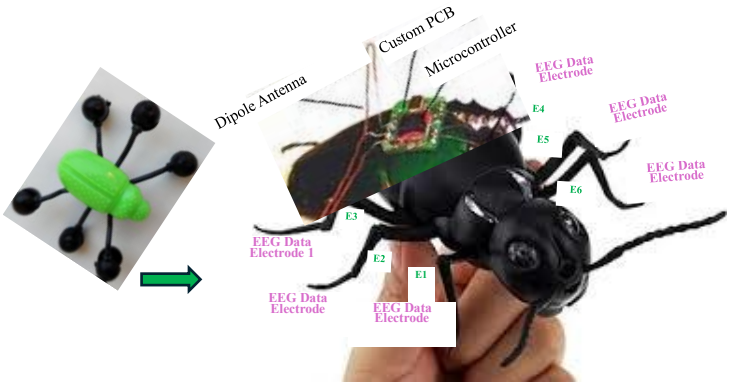


**Fig. 3** Beetle's 6 legs, used as MUSE sensor electrodes, controlled remotely.

## III. REMOTE HEALTHCARE SYSTEMS

The system shown in Fig. 3 can be used to test the health problems of people in remote areas where health experts are not available. The remote-controlled beetle, equipped with micro-MUSE electrodes, can be a source of help from a doctor for people in remote areas.

Details of MUSE-2 (a) headset, (b) circuit, and (c) electrodes are also shown in Fig. 3. Brain details and electrode positions are also shown. A universal doctor can also be equipped with AI, the so-called AI remote doctor.

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## IV. GLOBAL USE OF REAL AND AI HEALTHCARE

1. Use of universal migration of beetles and birds for real and AI (Artificial Intelligence) healthcare is possible. It is important to know the range of usage of real and AI healthcare for remote area patients and people in danger. It seems possible to extend the range to hundreds/thousands of miles. As shown in Fig. 4, for the three migrating birds' group (see A and B), sensors and circuits can be mounted in areas A and B. Part D shows this for a beetle partly already done. MUSE-2 part needs to be done.

2. Medical professionals can treat remote patients using remote controlled beetles and birds. One needs to determine the range of locations that medical professionals can serve. Another important factor is the qualifications of people present at remote locations. What are the qualifications of real and AI professionals present in remote locations?

3. One of the migrating birds can be an AI Bird (AIB) reaching the whole earth providing remote healthcare. The birds migrate because (a) they are looking for food or (b) a place to nest [9]. A change in weather may prompt birds to search for warmer climates. Migration can occur in the fall, winter, spring, or summer. An AIB can provide unique information about a group of migrating birds.

4. Long distance migration involves thousands of miles [9]. Short distance migration involves tens or hundreds of miles. Short-distance migrants include robins and waxwings. Most North American birds fall into this category, including geese, orioles, and flycatchers. Birds land, get food, and then continue the flight. The AIB can provide very accurate information about bird migration currently not available.


**Fig. 4** Global migration of birds (C). For the three migrating birds' group, sensors and circuits can be mounted in areas A and B; this has not been done. Part D shows this for a beetle partly already done. MUSE-2 part needs to be done; https://doi.org/10.3389/fnins.2010.00199.

## V. CONCLUSIONS

A micro-version of MUSE-2 can be installed on a remote-controlled beetle or other migrating birds to monitor the mental state of victims in earthquake/disaster/remote areas. This can also be used in other dangerous/disastrous environments and treat remote patients in areas where medical professionals are not available. A unique feature of this research is the installation of MUSE-2 electrodes on a remote-controlled beetle, bird and AIB (Artificial Intelligence Bird) to check the victim's condition in remote areas and report the results to medical professionals to treat/rescue people in remote areas.

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