**DIY - Hat for measuring EEG with dry electrodes for PiEEG**

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**Source** https://github.com/Ildaron/EEGwithRaspberryPI

This paper presents the results of creating an EEG cap from readily available materials without any special skills or tools. The electrodes used in this work are Ag-AgCl - Silver chloride electrode with a hole in the center for installation, Fig.1.

Fig.1. Examples of valid Silver chloride electrodes

To attach the electrode to the hat, a bolt can be used, the diameter of which should be smaller than the hole in the center of the electrode. It is necessary to use bolts with length 3-5 centimeter, washer, nut - M1, Fig.2.

Fig.2. Parts for attaching the electrode to the hat

It is recommended to use Copper cables (stranded, 1-3 mm) as wires, the length is set depending on the needs, Fig.3.

Fig.3. Wires for attaching to the electrode

Strap can be used as hat, for example strap for Camera Mount hat. Electrodes can be located in line international "10-20" electrode placement system, Fig.4.

a b

Fig.4. a - Camera Mount hat, b – arrange the electrodes according to the international "10-20" electrode placement system

**3. What you need to do**

Prepare cables. Strip the wires of isolation, a few centimeters, as showed in the Fig. 5.

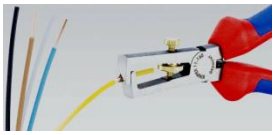

Fig.5. Cable preparation

To connect the electrode to the hat it is necessary to take Bolt, Nuts, washers, cable – 1, and Hat EEG – 2. First, clamp the cable between the nut and the bolt, then thread the bolt through the hat and fix it on the other side with the nut, as shown in Fig.6.

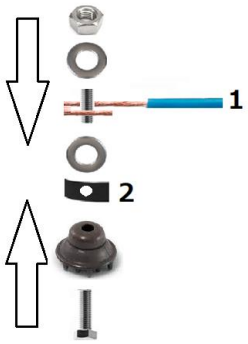


Fig.6 Scheme of connecting the electrode with a hat

As a result, the prepared electrode should look like shown in Fig.7.

Fig.7. Electrodes prepared for installation in the hat

Next, it is necessary, in accordance with according to the international "10-20" electrode placement system, make holes for electrodes in the hat, insert the electrode and fix it with a bolt from the other side of the hat, Fig. 8.

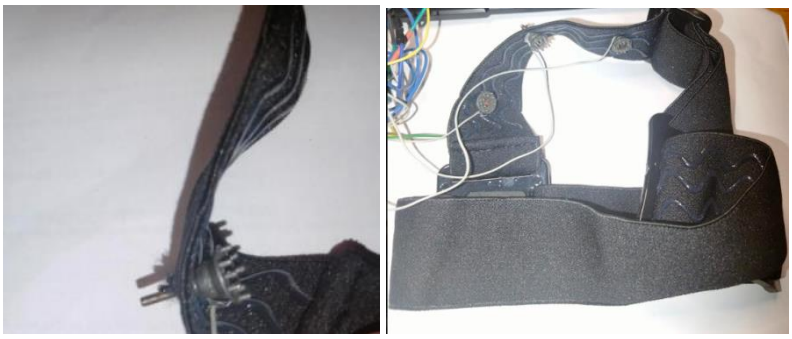

Fig.8. An example of installing electrodes in a hat

The pressure of the electrode on the head is adjusted independently as far as it is convenient, the clamping force will largely depend on which caps material was used, also, each electrode must be manually adjusted after putting on the cap.
The connection of electrodes to the PEEEG board is shown in Fig. 9. Even to measure one EEG channel, 4 electrodes are required, these are 1 - the EEG electrodes themselves, 2 - the reference electrode, 3 - the ground electrode, and the bias electrode to eliminate common mode interference.

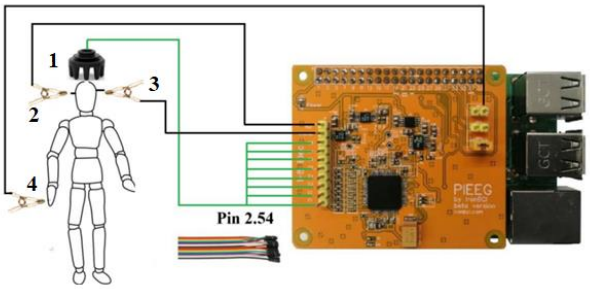


Fig.9. Scheme of connecting electrodes to the PEEG plan: 1 – EEG electrode, 2 – reference electrode, 3 – ground electrode, 4 – bias electrode

**Conclusion**

This paper presents one of the simplest ways to make a cheap alternative for a hat for setting EEG signals. The main advantage is low cost. This hat is designed for the most part to work in conjunction with the PIEEG board and is intended just for make first steps in the world of neuroscience. This is just an example, that can be improve, supplement, and modify the proposed ideas in this work

Additional Information

- Overview of dry electrodes
- Additional Information Machine learning to identify alcoholism
- Signal processing