Invited Talk

Human motion energy harvesters for wearables

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As wearable technologies are reducing power consumption down to milliwatt and lower, human motion energy, when obtained by a harvester, becomes a potential way to supply them. In this study authors analyze the most promising motion energy harvesters by their working principle (electrostatic, piezoelectric and electromagnetic) and efficiency in converting human motion energy into electrical. It was concluded, that electromagnetic motion energy harvesters show the highest efficiency in conditions of low frequency (few Hz), high amplitudes (centimeter range) and relatively slow speed (few meters per second), which relates to typical human motion. Usually electromagnetic harvesters for such purposes are produced as cylindrical coils with magnets, which are brought into motion by external periodic force. As clothing is mostly consisting of flat elements, such three-dimensional structures are hard to implement into apparel. To deal with this problem, it is suggested to replace volumetric coil with a flat spiral-shaped conductive structures. Proposed spiral-shaped inductors are two-dimensional and can be integrated into clothing without significant changes of appearance and properties. This kind of converter structure uses relative motion of different parts of apparel along each other, bypassing traditional way of magnet moving inside the coil. Dependence of inductor shape, material, location and integration method on generated energy is under investigation. Different clothing prototypes (jacket, overcoat, skirt etc) with implemented harvesters have been developed and tested.