A Summary of fMRI presentations

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fMRI is a modern technology basing on the previous MRI. Charles Scott Sherrington is the first man point out the fundamental theorem of fMRI, following his step, Torkomyan developed clinical MRI on 1979 (WellCome Trust, 2011). The first applied Seiji Ogawa creates fMRI bold imaging introduced theorem on 1990 in NOKIA BELL LABS. The whole presentation will discuss the biology theorems, the E&M field and the application of modern fMRI technology.

There are several control structures in human's body, since the nervous system is one of the critical control structures of the human body (Kazilek, 2011), and the control center of the nervous system is the brain. When the body receives a stimulus, the brain will respond to this stimulus by requiring more oxygenated blood flow to the brain (Anand, 2016), so it is possible to detect the brain oxygen level to understand how the brain controls the whole body.

There are two magnetic fields produced by fMRI. In normal earth's magnetic field, the magnetic moment of a group of hydrogen atoms not in an external magnetic field are randomly oriented in a fashion where they cancel each other out. When a magnetic field created by MR applying on atoms, they will align such that their magnetic moment is parallel to the magnetic field (BMJ, 2002)

After the parallel operation makes the atoms’ deflection is observable, RF coils of fMRI make RF pulse that causes the nuclei in phase with each other and tip over the nuclei. When RF pulse stops and releases by photons, the vector returns to its original longitudinal position. The period cost by ‘return back’ is the T1 period. T1 is different for various brain matter, which means it is useful in MRI technology.

The most significant difference between MRI and fMRI is in the T2 period. In fMRI, the presence of other substances alters magnetic fields to some extent which is known as magnetic susceptibility magnetic susceptibility affects the rate of T2, this field inhomogeneity is accounted in T2\*. fMRI takes advantage of T2\* which is sensitive to changes in the level of oxygenated and oxygenated blood. (Plas, 2016)

There are many useful applications by fMRI in research and treatment area. The primary purpose of fMRI nowadays is drawing a 3D model of the human brain, which is helpful in brain researching area. And it also provided a functional way to assess patient’s brain, which is useful to plan for surgery and radiation therapy of the brain, and also can help to detect the effects of stroke and brain injury, or diseases such as Alzheimer's, which is useful in developing the future treatment program. However, there is some disadvantage for this new technology. Such like in the research part, brain activity is continuously, but the whole fMRI progress will take 5 to 10 minutes, this will cause the research loss time effectiveness and make it is hard to control variable. This cause scientist looking for new technology such like HD-DOT, or use big data technology to improve the fMRI accuracy.

This presentation given by group 6 is well prepared and providing a clear explanation of how the MRI work and introduce many useful applications.

**References:**

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