**Title:** Neuronavigation: pushing the limits of Neurosurgery

**Concentration Area:** Medicine (Biological Sciences)

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**Abstract:** Amongst all medical sciences, neurosurgery is one of the most intricate and complex ones. Therefore, it is a specialty that is always searching for new instruments and techniques and pushing its limits in order to obtain a better understanding of the structure and functions of the nervous system and to develop therapeutic strategies that will provide an impact in patient outcome. Arguably neurosurgery relies on technology and its progress more than other surgical specialties, and it needs to be in constant communication with other areas of sciences, some of them very distinct, like bioengineering, physics, anatomy, and more. There are several sophisticated devices to assist the neurosurgeon, including microsurgical techniques and the operating microscope, radiosurgery, sensorimotor evoked potentials, endoscopic guided surgery, robotics, to name a few, but probably the most important one is neuronavigation, which is an emanation of the development of neuroradiology. It can be considered the ultimate headway in the aspiration to transfer image information in the operative field, a goal that neurosurgeons have tried to attain for over thirty years. Briefly, neuronavigation provides a three-dimensional model of the patient using modern neuroimaging studies (magnetic resonance imaging and computerized axial tomography), allowing pre-operative planning and identification of relevant structures in the surgical setting. In this presentation, we intend to discuss the birth and evolution of this revolutionary neurosurgical advancement, with an emphasis on its main historical milestones, to present its current concepts and achievements, to address its main limitations and point out ways to overcome them, and to stimulate the debate of the future trends of frameless stereotaxy.

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