



## Wireless Magnetic Intraocular Microrobots

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Microrobots have the potential to dramatically change the face of medicine. At ETH Zurich we are developing wireless magnetically controlled assembled-MEMS microrobots for retinal procedures. Our goal is to make current retinal procedures safer and less invasive, and to create entirely new procedures that were never before possible. The eye is a unique *in vivo* environment in that we have a direct line of site to the microrobot, greatly simplifying the localization problem. The microrobot will enable minimally invasive diagnostic tools such as wireless oxygen sensing, as well as therapies for conditions such as retinal-vein occlusions. In addition to exploring these specific tasks, we have developed accurate models for magnetic torque and force on simple axially symmetric geometries, as well as for assembled-MEMS structures. We have designed a novel electromagnetic field-generation system that will enable wireless 5-DOF control of an untethered device over the relatively large distances required for *in vivo* applications, which has never before been demonstrated. The system design may also be useful for other wireless micromanipulation systems. Finally, we have explored the possibility of using other magnetic microrobot propulsion methods, such as helical propellers that mimic bacterial flagella.



Jake Abbott earned a Ph.D. in mechanical engineering in 2005 at the Johns Hopkins University in Baltimore, Maryland. He investigated “virtual fixtures,” which are software guidance modes that assist a human user in performing telemanipulation tasks. Since completing his degree, Jake has been a postdoctoral research associate in the Institute of Robotics and Intelligent Systems at ETH Zurich in Switzerland. He leads a team of students investigating wireless biomedical microrobots.

**Friday, FEBRUARY 29th, 2008**

**10:00 am Seminar in 233 Mudd**

**9:30 am Breakfast in ME Lobby**