



# HANYANG UNIVERSITY

## 2019 HISS Research Project (Tactile screen based on ferrofluid for Braille characters)

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Website	

Laboratory Research Center Information	
Topics	- Tactile screen based on ferrofluid for Braille characters
Activities	- Design a test bed for evaluating tactile activation of ferrofluid - System integration: material selection, lithography, circuit design - Microprocessor programming
Achievement	- Proposal for government-funded projects - Application to tactile perception for virtual reality - Venture startup

Pre-requisite & Eligibility	
Academic Background	- College level physics (magnetism, electricity) - Basic electronic circuit design (transistor, relays) - Microprocessor programming
Relevant Experience	- Lithography (not required but recommended)
Language	- Proficient English speaking and writing

Objective & Description:	The student is asked to design and build a tactile perception system based on a ferrofluid. The sealed magnetic fluid is driven by a network Cu electrical lines. Electrical current and volume of ferrofluid are adjusted for optimal tactile sensation. Upon successful design of the system, a microprocessor is used automatically display the Braille characters on the tactile system.		
Project Duration	6 weeks	Project Hours:	minimum 80 hours

Schedule:	Weekly Topic & Activities	Student Assignment
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### Hanyang International Summer School

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Week 1	<ul style="list-style-type: none"> <li>- Introduction</li> <li>- Literature survey</li> <li>- Build a simple testbed for evaluating ferrofluid (current, magnetic force, displacement)</li> </ul>	<ul style="list-style-type: none"> <li>- A written report on basic principles of tactile activation using magnetic force</li> <li>- Calculate and verify the basic parameters of a ferrofluid-tactile perception system</li> </ul>
Week 2	<ul style="list-style-type: none"> <li>- Electrical circuit design</li> <li>- Use a simple lithographing process to build the required circuit</li> <li>- Experiment with various sealing materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on circuit design</li> <li>- Identify ways to effectively isolate the ferrofluid on the substrate using an elastic sealing cover</li> </ul>
Week 3	<ul style="list-style-type: none"> <li>- System optimization</li> </ul>	<ul style="list-style-type: none"> <li>- Report on basic principle of lithography</li> </ul>
Week 4	<ul style="list-style-type: none"> <li>- System optimization</li> </ul>	<ul style="list-style-type: none"> <li>- Report on various tactile sensor and perception systems (current and future)</li> </ul>
Week 5	<ul style="list-style-type: none"> <li>- Microprocessor programming for the Braille characters</li> <li>- Prepare the interface to connect the microprocessor to the tactile sensor system</li> <li>- Testing and system optimization</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the microprocessor programming for the Braille system</li> </ul>
Week 6	<ul style="list-style-type: none"> <li>- Design and fabricate an external frame</li> <li>- 3d printing of the external frame</li> <li>- Preparation for final presentation</li> </ul>	<ul style="list-style-type: none"> <li>- 10 pages written final report</li> <li>- 15 min. oral presentation + 5 min. Q&amp;A</li> </ul>

Evaluation	Attendance	Weekly Report	Final Presentation or Paper
	30%	40%	30%