

Niall L. Williams

niallw@cs.umd.edu \diamond niallw.github.io

EDUCATION

University of Maryland, College Park, MD, USA

Aug 2019 - Present

PhD in Computer Science

- Research interests: Virtual/Augmented reality, perception, motion planning, human-computer interaction
- Advisors: Dr. Dinesh Manocha & Dr. Aniket Bera

Davidson College, NC, USA

Aug 2015 - May 2019

B.S. with High Honors in Computer Science

- Thesis Title: Estimation and Comparison of Rotation Gain Thresholds for Redirected Walking
- Advisor: Dr. Tabitha Peck

AWARDS & HONORS

Best Paper Honorable Mention (IEEE VR 2021)	2021
Dean's Fellowship, University of Maryland, College Park	2019, 2020
Senior Computer Science Award, Davidson College	May 2019
Nominated for CRA Outstanding Undergraduate Researcher Award	Oct 2018

RESEARCH EXPERIENCE

Locomotion for Virtual Reality (gamma.umd.edu)

Jan 2020 - Present

- **Background:** In virtual reality, the size of the physical tracking space limits the size of the explorable virtual environment. Using a technique called redirected walking, we can steer users towards different directions in the physical space without interfering with their virtual experience by slowly rotating the virtual environment.
- Developing steering algorithms to minimize the chance of collision with physical obstacles. Focus is on shared, collaborative virtual experiences between multiple users who are in separate physical spaces.
- Developing a combined geometric and perceptual metric for quantifying the difference in navigability between the physical and virtual environments, to assess steering algorithm performance without empirical tests.

Perceptual Thresholds for Virtual Reality Locomotion

May 2018 - present

- **Background:** Psychophysical experiments typically require large amounts of trial data in order to measure perceptual thresholds, which can negatively affect results due to fatigue or boredom. Participants' confidence ratings may help us estimate perceptual thresholds using fewer experimental trials.
- Investigating the efficacy of a novel model for estimating perceptual thresholds with very little data, augmented with the user's self-perceived confidence level. Focus is on psychometric curve fitting with small data sets.
- Studying interactions between user confidence in their perception and predicting the onset of simulator sickness. Confidence ratings may offer a low-cost method for identifying users who are susceptible to simulator sickness.

Gaits for Virtual Avatars (gamma.umd.edu)

Aug 2019 - Jan 2020

- **Virtual Avatars:** Worked on synthesizing and retargeting emotional gaits for realistic virtual avatars. Main contribution was in evaluating the results and investigating motion retargeting methods.

Haptics for Teaching Physical Concepts (perceptproject.weebly.com)

July 2019 - Aug 2019

- **Background:** Haptics can be used to augment the ways we interact with and understand virtual environments. The main question in this work is whether haptic technology can help pre-service elementary school teachers better understand concepts of physics so they are better prepared to teach these concepts in the classroom.
- Implemented features into a physically-based buoyancy simulation to visualize forces and properties of buoyancy with haptic force-feedback.
- Explored the efficacy of different haptic input and feedback modes for future research involving concepts of thrust and drag.

PUBLICATIONS & INVITED TALKS

Computer science uses competitive conferences (15-30% accepted) as the main publication venue. The top venues in virtual reality (IEEE VR and ISMAR) also offer a track to submit work to be accepted as journal publications (IEEE Transactions on Visualization and Computer Graphics) and presented at the conference.

Journal Papers

- [1] **NL Williams**, A Bera, D Manocha. Redirected Walking in Static and Dynamic Scenes Using Visibility Polygons. *IEEE Transactions on Visualization and Computer Graphics*, 2021 (Proc. ISMAR 2021) (19.7% acceptance rate)
- [2] **NL Williams**, A Bera, D Manocha. ARC: Alignment-based Redirection Controller for Redirected Walking in Complex Environments. *IEEE Transactions on Visualization and Computer Graphics*, 2021 (Proc. IEEE VR 2021) (15.5% acceptance rate) **[Best paper honorable mention]**
- [3] **NL Williams** and TC Peck. Estimation of Rotation Gain Thresholds Considering FOV, Gender, and Distractors. (Proc. ISMAR 2019) *IEEE Transactions on Visualization and Computer Graphics*, 2019 (8.6% acceptance rate)

Conference Papers

- [1] U Bhattacharya, N Rewkowski, P Guhan, **NL Williams**, T Mittal, A Bera, D Manocha. Generating Emotive Gaits for Virtual Agents Using Affect-Based Autoregression. *IEEE International Symposium on Mixed and Augmented Reality*, 2020 (22.8% acceptance rate)

Workshop Papers and Posters

- [1] **NL Williams**, A Bera, D Manocha. Redirection Using Alignment. *IEEE VR 2021 Locomotion Workshop*, 2021
- [2] K Qi, D Borland, E Jackson, **NL Williams**, J Minogue, and T Peck. The impact of haptic and visual feedback on teaching. *IEEE Conference on Virtual Reality and 3D User Interfaces (VR)*, 2020
- [3] K Qi, D Borland, **NL Williams**, E Jackson, J Minogue, and T Peck. Augmenting Physics Education with Haptic and Visual Feedback. *IEEE VR 2020 Fifth Workshop on K-12+ Embodied Learning through Virtual Augmented Reality (KELVAR)*, 2020
- [4] J Minogue, D Borland, T Peck, E Jackson, K Qi, and **NL Williams**. Tracing the development of a haptically-enabled science simulation (hesss) for buoyancy. *NARST Annual International Conference*, 2020
- [5] **Niall Williams** and Tabitha C Peck. Estimation of rotation gain thresholds for redirected walking considering fov and gender. *IEEE Conference on Virtual Reality and 3D User Interfaces (VR)*, 2019

Invited Talks

- [1] ARC: Alignment-based Redirection Controller for Redirected Walking in Complex Environments, *SIGGRAPH 2021 TVCG Session on VR*, SIGGRAPH 2021.
- [2] Measuring Perceptual Limits of Redirected Walking in Virtual Reality, *Davidson College Coffee Talk*, Davidson College, NC, 2018.

TEACHING EXPERIENCE

Bioinformatic Algorithms, Databases, and Tools (CMSC 423) TA <i>University of Maryland, College Park</i>	Jan 2021 - May 2021 <i>College Park, MD</i>
• Hold office hours, design quiz questions, and grade assignments and exams.	
Advanced Data Structures (CMSC 420) TA <i>University of Maryland, College Park</i>	Aug 2020 - Dec 202 <i>College Park, MD</i>
• Hold office hours, assist with questions during lectures, and grade assignments and exams.	
Stanford Code In Place Online Section Leader (Volunteer) <i>Stanford University Computer Science Department</i>	April 2020 - May 2020 <i>Online</i>

- Code In Place was a 5-week online introductory course on programming offered by Stanford University during the COVID-19 pandemic, aimed at teaching people a new skill during lockdown. All participation was voluntary.
- Led weekly review sessions and held office hours for 10 people in the course.

Game Programming (CMSC 425) TA

University of Maryland, College Park

Jan 2020 - May 2020

College Park, MD

- Redesigned assignments and labs to provide students with more practice in implementing theoretical concepts.
- Hold office hours, assist with questions during lectures, and grade assignments.

Advanced Data Structures (CMSC 420) TA

University of Maryland, College Park

Aug 2019 - Dec 2019

College Park, MD

- Hold office hours, assist with questions during lectures, and grade assignments and exams.

Head TA

Davidson College Mathematics & Computer Science Department

Jan 2019 - May 2019

Davidson, NC

- Coordinated shift scheduling for all computer science TAs.
- Liaised with TAs, graders, and professors to resolve any problems throughout the semester.
- Worked with the department to create a more structured environment for future graders and TAs.

Computer Science Tutor

Davidson College Center for Teaching & Learning

Aug 2018 - May 2019

Davidson, NC

- Assist peers in learning new programming languages, troubleshooting coding issues and understanding introductory course-related concepts.
- Guide peers toward developing an independent thinking style through open-ended questions.
- Courses tutored: Programming and Problem Solving, Discrete Structures, Data Structures, Computer Organization, Bioinformatics Programming.

Computer Science Grader

Davidson College Mathematics & Computer Science Department

Aug 2017 - Dec 2018

Davidson, NC

- Grade and provide feedback on assignments for 20–40 students per semester.
- Feedback includes optimization, debugging, implementations of different data structures, and cleanliness.
- Wrote a script to automate grading for a new homework assignment.

PROFESSIONAL SERVICE & COMMUNITY INVOLVEMENT

Program Committee	SIGGRAPH Research Career Development Committee	2021
Reviewing	IEEE VR (2020, 2021), ISMAR (2021), MobileHCI (2021)	
Student Volunteer	IEEE VR (2020, 2021), ISMAR (2019)	
University of Maryland	Graduate school application mentor	2020
	Graduate admissions application reviewer	2019 - Now
Davidson College	Math & CS department student representative	2018 - 2019
	Davidson College ACM chapter co-founder	2018 - 2019

PROGRAMMING SKILLS

Languages: C/C++, C#, Python, R, Java

Software Packages and Tools: Unity3D, SteamVR, OpenGL, D3.js, git, L^AT_EX

Operating Systems: Linux (Ubuntu), Windows