אורט בראודה
ORT Braude College

Date: 29/09/2022

Name : Avishag Pelosi, Orit Braun Benyamin

Title : A special chair for Amin, Mehalev – From the Heart – Engineering solutions for people with disabilities

Department : Mechanical Engineering

Project Title	
Project description: (max. 250 words)	The Flagship program is dedicated to the development of engineering solutions for people with disabilities. The present project is a tailor-made chair for Amin, a 21-years old fellow who has recently joined the occupational center Shibolim, a rehabilitative-occupational center designed to improve the lives of people with disabilities. Shibolim is part of the Cochav Hatzafon Association, which operates multi-disability employment centers in many locations throughout the Galilee and the Golan Heights; it combines rehabilitation, employment and social opportunities. Because of a rare genetic syndrome, Amin is short of stature, he is 99 cm-high and has a minor mental development disorder. He is lively and kind, very committed to his work and enjoys his new occupational environment. But because of his stature it is difficult for him to join the other workers and make new connections, he generally sits isolated at a lower table. Recently the organization has improvised a solution, but it's rather rudimental and unsafe.

	The project consists of designing a tailor-made chair, that enables Amin to sit safely, comfortably and adjust to different height positions. This chair will allow Amin to participate more actively and feel deeper connection to his group. The solution may also be useful for similar clients, depending on the flexibility of the chosen design concept. The project is appropriate to 1-2 students, with a professional mentor and an academic supervisor. The students will meet Amin and the occupational therapists in order to understand their needs and formulate the adequate engineering requirements. Then a conceptual design and production of the chair will follow, in order to provide Amin with the best personalized solution.
Nature of project: (Tick the relevant boxes)	☒ laboratory investigation ☒ computing and analysis ☐ software development ☒ product development ☒ design ☒ field testing and instrumentation ☐ feasibility/case studies ☒ hybrid ((e.g., experimental and ☐ theoretical/experimental and ☐ numerical/software) ☐ Other
Relevant majors: (May be more than one if relating to interdisciplinary project)	Biomechanics
Expected achievements by project participants: (Up to 3 main outcomes)	• The student will meet people with disabilities and will receive counselling from physiotherapists and caretakers, as well as professional mentoring engineers. • The student will experience the process of designing a tailor-made

	engineering solution, from the formulation of client needs and related engineering requirements, to the creative implementation of a design concept. • The student will be part of an inspirational project with meaningful impact, providing an actual product to the client who is in need of a resourceful and creative solution that will improve dramatically his daily life.
Max. number of participants that can be hosted:	2
Supervisor: (Name, department, link to bio/research page, contact details)	Dr. Avishag Deborah Pelosi, Head, Biomechanics Internship, Mech. Eng. avishagp@braude.ac.il Dr. Orit Braun Benyamin, Head, Mechanical Engineering Department bborit@braude.ac.il
Name of lab participants will be attached to:	Biomechanics Laboratory
Any other information/requirements (e.g., programming skills, study prerequisites, reading lists)	Empathic and leadership skills, patience, motivation, knowledge of mechanical design, biomechanics, basic mechatronics

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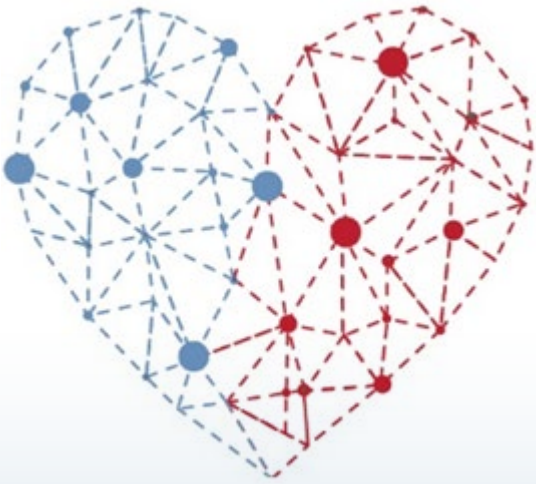


MEHALEV

From the Heart

Engineering Students for
People with Disabilities

The Flagship Program

MAKING A DIFFERENCE IN PEOPLE'S LIVES

Braude College's Flagship Program, led by the Mechanical Engineering Department, and supported by the Israeli Council for Higher Education (CHE), was established to encourage students' social responsibility and involvement in the community. Braude's academic expertise benefits needs of those most in need in the community in which it is located, as well as the students, faculty and society in general.

The direct and personal interaction with a disabled person, whether adult or child, leads to an overwhelming change in perceptions. Among our graduates currently employed in industry who were involved as students at Braude in developing projects for people with disabilities, our research has revealed the significant effect this has on the way they perceive their role as engineers.

The Flagship Program makes a difference – engineering for a better community

The **Mehalev** program was established to develop unique engineering solutions for people with disabilities. Some solutions are tailor-made for individual use, in accordance with a specific disability, while others are more widely applicable solutions for the public.

Disabilities vary greatly, and off-the-shelf products for the physically-challenged often require adjustments and individually-customized solutions. However, this requires a whole infrastructure and expertise to develop, and is often economically unviable. This is where Braude's Mehalev project steps in.

The program combines academic studies with the application of knowledge in the hands-on development of a solution to a real-life engineering problem. Students also volunteer in the community.

The Flagship Program

PROGRAM GOALS

To establish an interdisciplinary knowledge center of applied research for the development of engineering solutions for disabled people that is open and accessible to the public.

To create an infrastructure of collaborations with institutions that deal with rehabilitation of people with disabilities.

PARTNERS

- Ziv Medical Center, Orthopedic Dept., Zefat
- Galilee Medical Center, Rehabilitation & Geriatric Dept., Nahariya
- Rambam Medical Center, Neurological Dept., Haifa
- Bratt, home for the elderly, Karmiel
- Teffen School, CP class
- Ma'arag Art & employment Center for the disabled, Kfar Vradim.

REQUIREMENTS

WHO CAN APPLY?

Students in their final year of their BSc Engineering degree in biomechanics, mechanical engineering, industrial design engineering, software engineering or related fields.

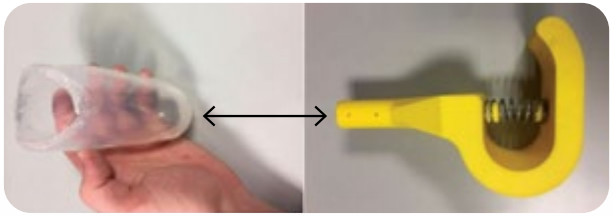
ACADEMIC REQUIREMENTS:

- Minimum grade average of
- Minimum credits accumulated:
- English: B2

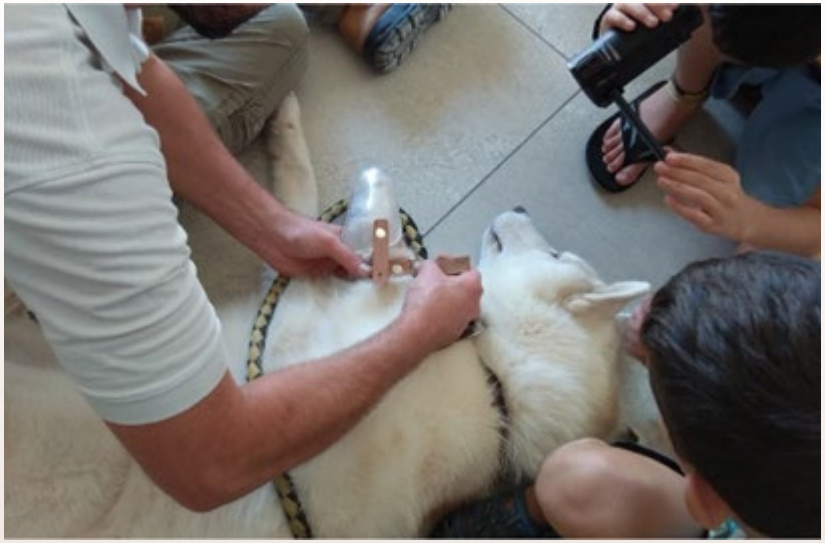
OUR 3D PRINTER WORKING ITS MAGIC: **STARKEY THE DOG**

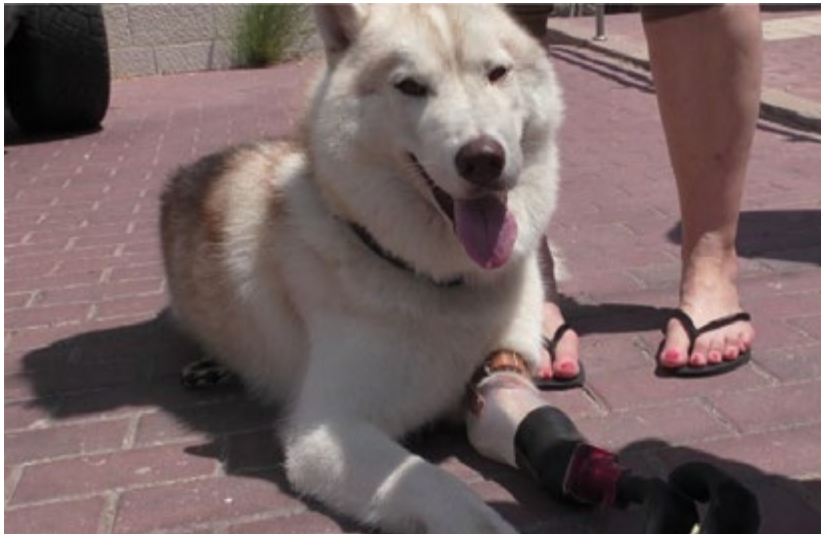
Starkey is a Siberian husky, 1 1/2 years old, who had lost a leg after being hit by a car.

The **MEHALEV** team fitted Starkey with a prosthetic limb produced by the 3D printer. The project was conducted in cooperation with Gapaim Orthopedic Institute, which specializes in custom fitted prostheses for limb amputees, and also imports and sells a wide range of orthopedic tools and instruments.

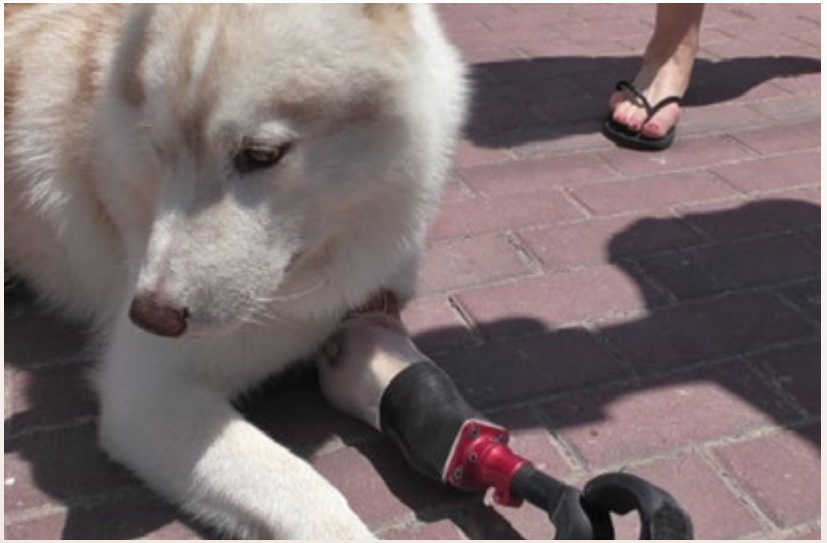


Ten different prototypes were printed and tested before finding an adequate solution.

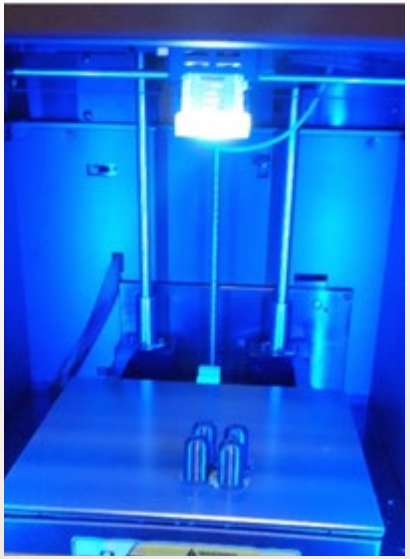




Today, Starkey is learning to walk with the aid his new prosthesis.



OUR 3D PRINTER WORKING ITS MAGIC: M.'S NEW BIKE



M. is a sweet five-year-old with a lower extremities disability. The team in Braude's biomechanics lab built her a special contraption enabling her to ride her bike and join her friends for an afternoon of fun.

Unable to paddle or steer the bike due to her disability, this apparatus allows a third party to drive the bike, as well as adjust the seat and peddle height.

WACOM BOARD: DRAWING MUSIC

The Wacom Board is integrated into many projects carried out in Braude's biomechanics laboratory, more specifically for the purpose of making music accessible to people with disabilities.

One of the innovative and groundbreaking ideas using the Wacom Board was investigating the ability of a person with communication problems to draw music or, alternatively, allow a handicapped person to draw music while adapting motor skills, range of motion, clicking ability, speed of movement to musical parameters.

Drawing Attention – International Students

Tyler Bray, an undergraduate student from the University of Pittsburgh's Swanson School of Engineering completed a summer internship at Braude.

He built a feedback system attached to a walker, enabling post-stroke patients to exercise bearing weight on their upper extremities and practice walking.


UNIVERSITY OF PITTSBURGH | SWANSON SCHOOL OF ENGINEERING | DEPARTMENT OF BIOENGINEERING

Development of the Handle Grip of a Walker for Hemiplegic Post-Stroke Patients

אורט בראודה
ORT Braude College

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Introduction

A stroke is one of many health complications which can have a negative impact on an individual's gait and balance. Hemiparesis is a neurological condition that impacts nearly 80% of the 796,000 stroke survivors in the US every year. This lack of sensation, and therefore reliable biological feedback, can cause a hemiplegic post-stroke patient to not push their walker with symmetric force while relearning to walk. This asymmetrically applied force directly impacts gait and stability, ultimately affecting safety and comfort.
It has been shown that "dynamic visual kinematic feedback from wireless pressure and motion sensors had similar, positive effects as verbal, therapist feedback". One study used a cane with a pressure sensor and audible beeps as feedback and found that it was "beneficial and effective in improving...muscle activation, and gait in stroke patients". These results, paired with inquiries from local physiotherapists, have driven the design of this device.

Objectives

Main Goals:
1. Analyze existing problem and solutions
2. Develop versatile, low-cost alternative
3. Create user-friendly device
4. Test efficacy of new system

Hypothesis:
The successful development of such a device will effectively provide therapists with a tool to improve gait therapy and increase patient independence.

Methods

Component 1: **Open handle**

The affected hand is typically wrapped in place because of it's decreased strength post-stroke. The handle can be used by right or left hand.

Component 2: **Closed-grip handle**

The unaffected hand can grip a handle with a standard shape. A force sensitive resister in both this and **Component 1** take readings of forces applied by the hands.

Figure 1: **Assembly of walker handle grip system**

Component 3: **Electronics Housing**

This housing contains LEDs and a speaker (for visual and auditory feedback). Other components include an on/off switch and volume knob, along with the microcontroller.

Component 4: **Clamps**

Clamps, typically used in a high-end camera system, have been repurposed to allow therapists to affix the system to any walker with ease while still maintaining stability.

Data Processing

Data regarding the effectiveness of this device will be gathered using the following tests:
- **Fugl-Meyer Assessment** analyzes upper and lower extremity capabilities in areas concerning motor function, balance, sensation and joint function.
- The **Timed Up and Go** test looks at the time it takes a patient to stand up from a chair, walk a measured distance, and return to the chair
- A **Six-Minute Walk Test** evaluates how far a patient can walk during a six-minute session
- **Questionnaires** with subjective topics related to their comfort and satisfaction with the device, as well as their confidence in walking ability

Conclusion

Thousands of patients every year must undergo physical therapy to relearn to walk after surviving a stroke. Currently, hemiplegic stroke survivors rely on therapists to watch their movements to identify issues with gait symmetry.
The goal of this device is to partially remove this burden of observation from the therapist by allowing the user to make corrections themselves. The low production cost and simplicity of this device of this device opens up the possibly of being used during at-home rehabilitation exercises, and not just in the in-patient setting.

Acknowledgements

We would like to thank the Swanson School of Engineering and the Office of the Provost at the University of Pittsburgh for providing the funding for this project. Additionally, we would like to thank the physical therapy unit at the Galilee Medical Center for their cooperation and expertise.

Join Mehalev

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COMMUNITY ORIENTED ENGINEERING

MEHALEV
From the Heart
Engineering Students for People with Disabilities

Braude's Mehalev project offers interns the opportunity to deal with real-life engineering problems and experience the satisfaction of directly improving someone's daily life.

Interns can opt to join our international students in the extra-curricular activities offered in Braude's Study Abroad spring semester program. This introduces students to Israel's unique social and cultural life and history.

Braude College strives to establish itself as leading center of knowledge and engineering solutions for people with special needs.

For more information and application details contact us:

International Office:
international@braude.ac.il