From Anthropomorphic to Zoomorphic Social Robots: Our Experiences

Patrick C. K. Hung

Faculty of Business and IT

Ontario Tech University, Canada

Seminar @ Universidad Politécnica de Madrid, Spain

January 24, 2024

Salute

- Our Team Members
  - Dale Mcinnis, PhD Student
  - Samuel Agaga, PhD Student
  - Jennifer Cardenas, Master Student
  - Marco Cano, Master Student
  - Carolina Velasco, Master Student
  - Jackson Sears, Master Student
  - Devika rani Padam, Master Student
  - Anuhya Dasika, Master Student
  - Kevin Jhong, Visiting PhD Student
  - Sunny Tseng, Visiting Master Student
  - Jasper Tsai, Visiting Undergraduate Student
  - Kaixuan Koh, Visiting Undergraduate Student

NSERC CRSNG

PromoScience

CNIB FOUNDATION

CNIB GUIDE DOGS

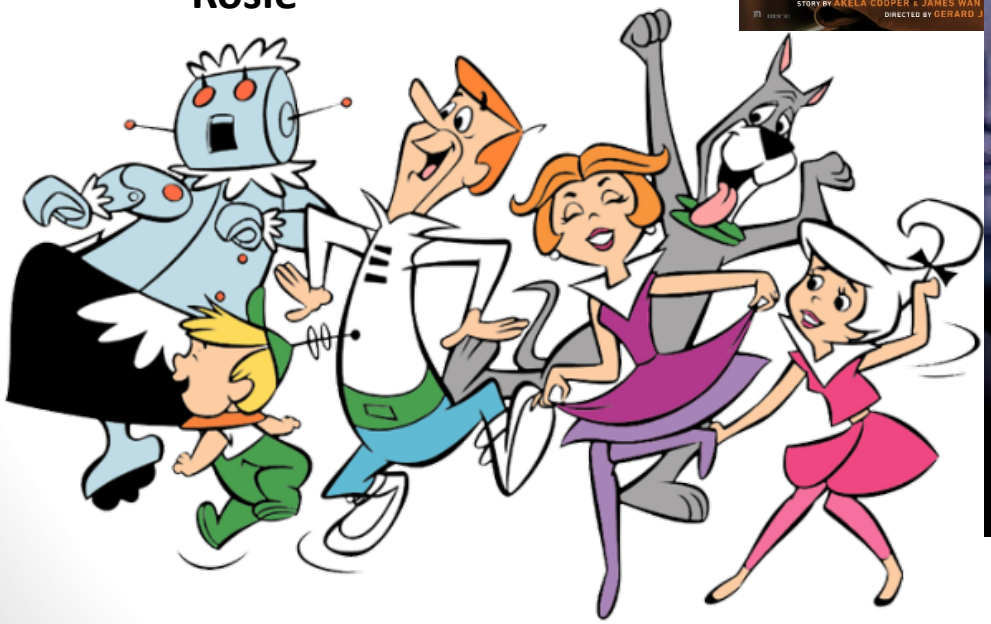
Accessibility Standards Canada

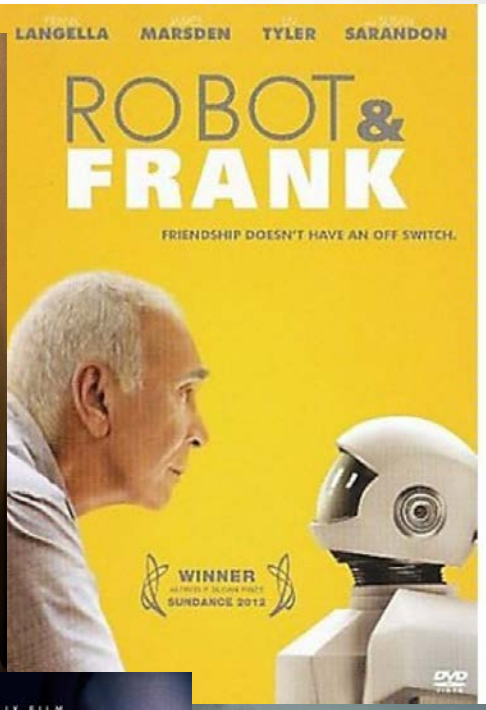
Normes d'accessibilité Canada

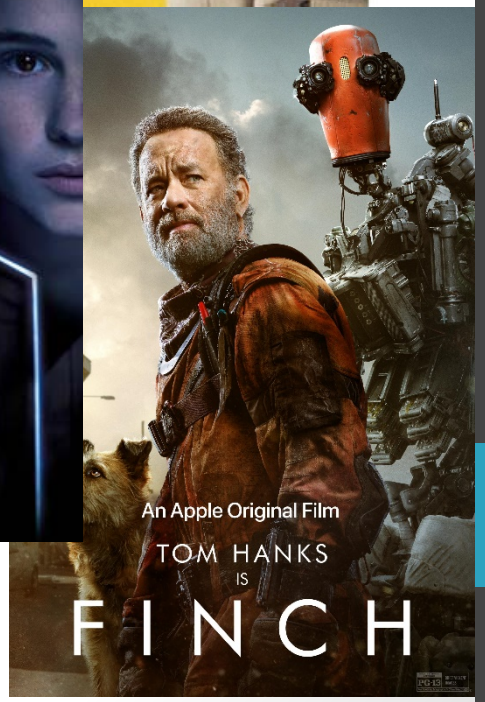
The Jetsons

- *Back in 1962, when the cartoon The Jetsons first aired on TVs across the nation, everything about it seemed like it came from a very far and distant future.*

Rosie





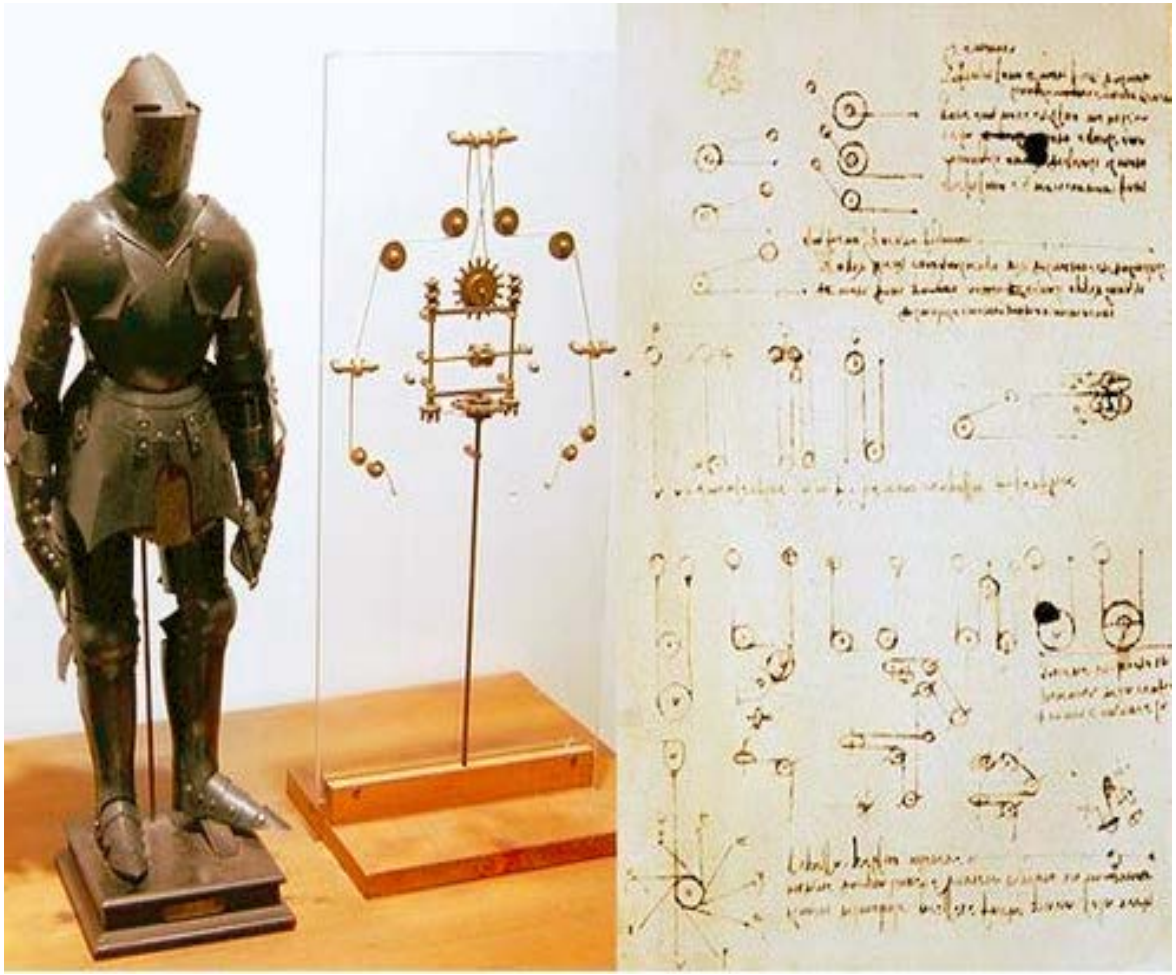


Source: Google Images

Ethics in Robot

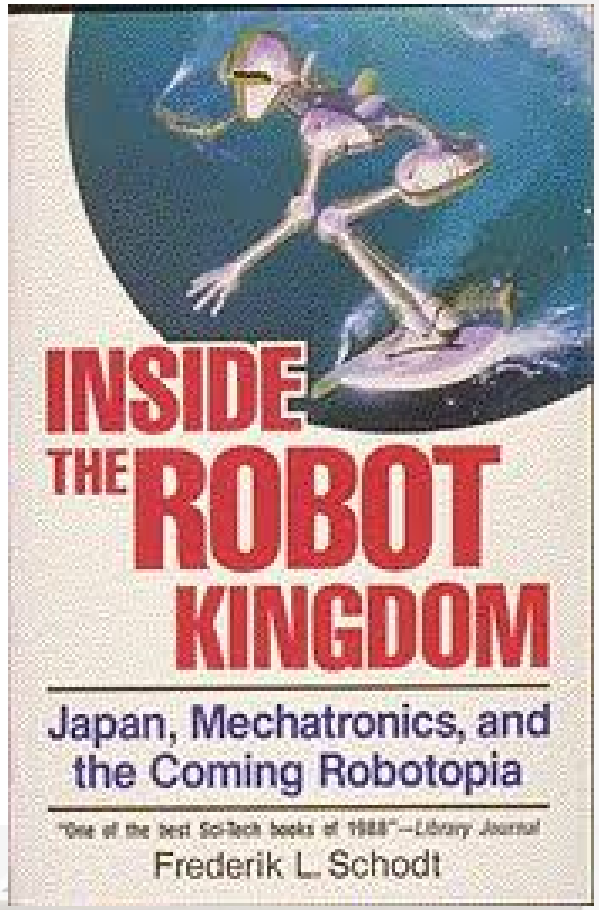
- Isaac Asimov (January 2, 1920 - April 6, 1992) proposed three rules of robotics that would safeguard humanity from malevolent robots:
  1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
  2. A robot must obey the orders given to it by human beings except where such orders would conflict with the First Law.
  3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.
- Although Asimov's work is highly visible in the public media, it has been criticized by philosophers.
- Asimov eventually added a zeroth law:
  0. *A robot may not harm humanity or, by inaction, allow humanity to come to harm.*

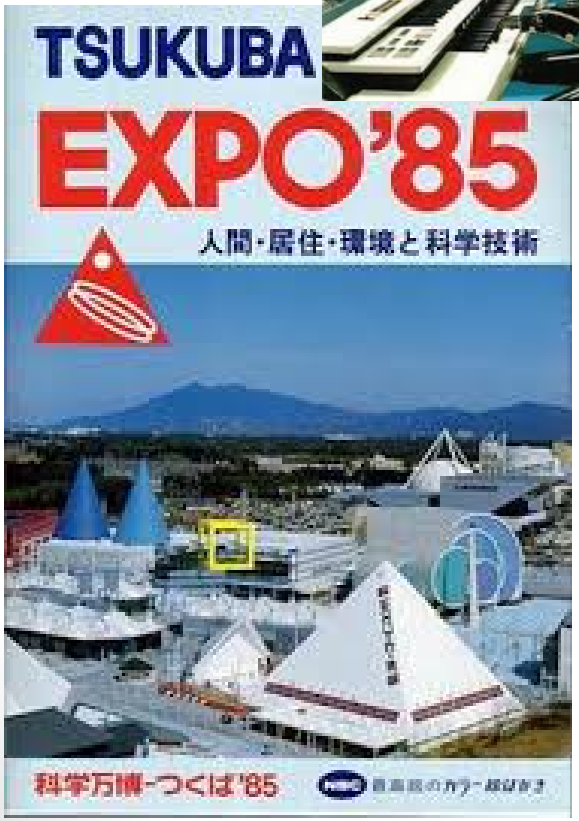
First Robot in History by Leonardo da Vinci (1452-1519)

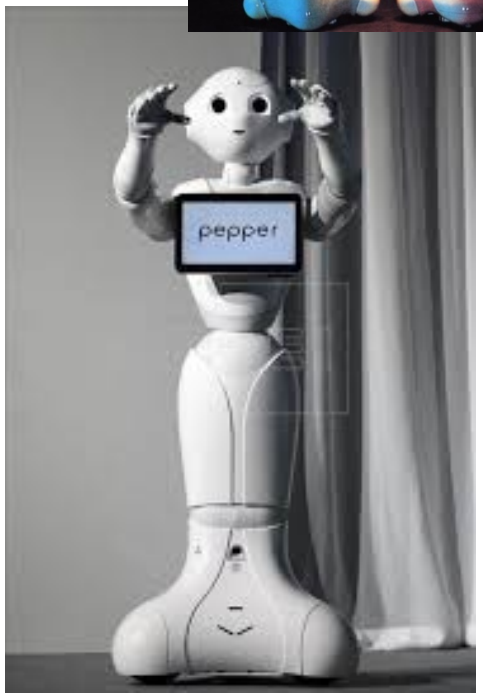


Ref: Gorvett, Zaria. “Future - Leonardo Da Vinci's Lessons in Design Genius.” BBC News, BBC, 28 July 2016: https//www.bbc.com/future/story/20160727-leon

Japan is Robot Kingdom!







Source: Google Images

Global NEWS

Toronto
Change Location

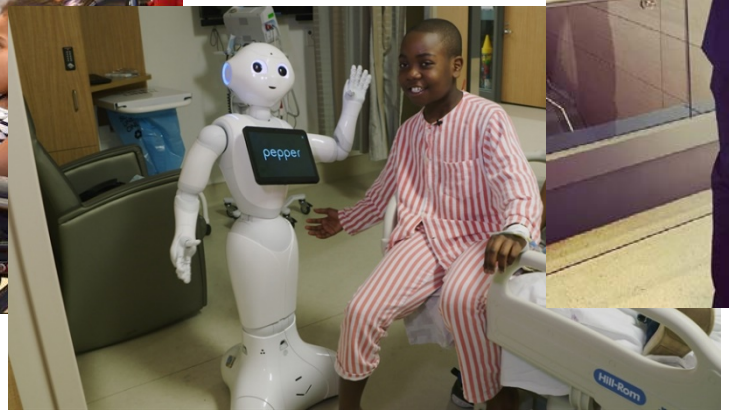
News & Radio Programs
Newscasts, Radio, and Videos

World Canada Local Politics Smart Living Money Entertainment Health Commentary Trending

CANADA May 6, 2018 8:00 am

Meet Pepper – Canada's first emotionally sensitive robot for sick kids

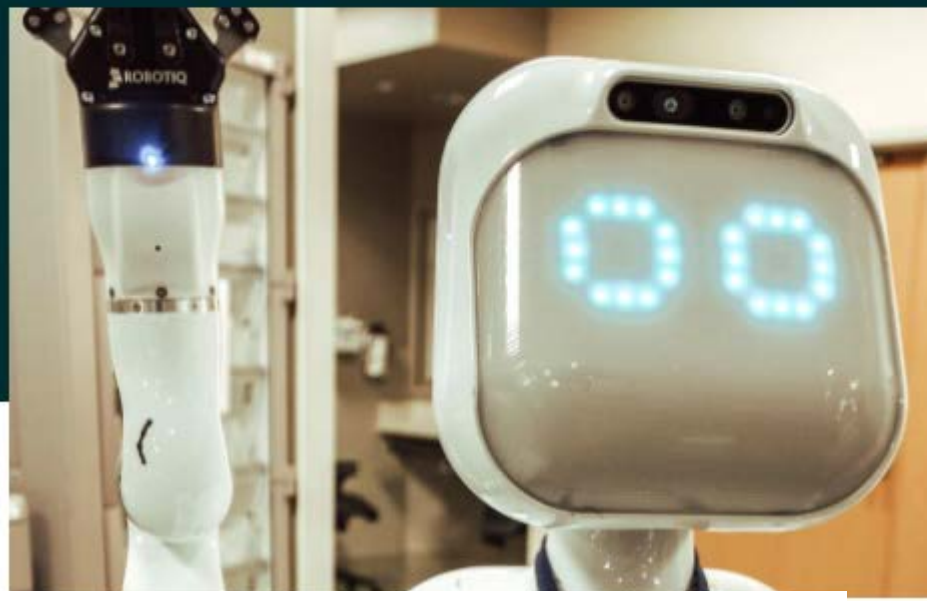
By Aalia Adam
Online Video Journalist Global News



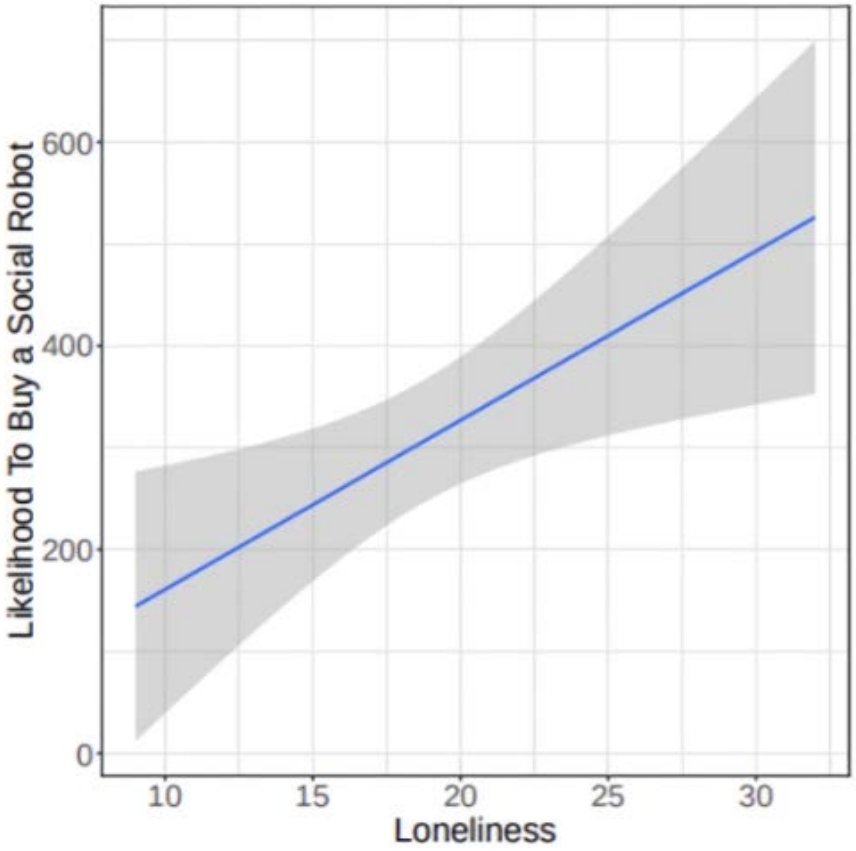
Source: Global News Toronto and Google Images

Researchers find people are more receptive to social robots during the pandemic

Kyle Wiggers @Kyle_L_Wiggers August 13, 2020 8:30 AM AI



In an attempt to gauge the public's perception of social robots during the pandemic, the researchers designed an online questionnaire that asked subjects to report their loneliness, stress levels, adherence to lockdown rules, and the overall effect of the pandemic on their lives, as well as their attitudes toward social robots (specifically whether their perception had changed as a result of the pandemic and the likelihood they would buy a social robot). Drawing on studies that suggest a relationship between loneliness and the "big 5" personality traits — neuroticism, agreeableness, extroversion, conscientiousness, and openness — the researchers also had respondents, who were recruited through Amazon Mechanical Turk, complete a brief personality assessment.



Source: https://venturebeat.com/2020/08/13/researchers-say-people-are-more-receptive-to-social-robots-during-the-pandemic/

Some Florida seniors isolated with Alzheimer's and dementia due to the pandemic are getting robotic therapy pets

By **Allen Kim**, CNN

Updated 4:45 PM ET, Mon April 27, 2020

Singapore deploys robot 'dog' to encourage social distancing

By Michelle Toh, CNN Business

Updated 7:56 AM ET, Fri May 8, 2020

Source: www.cnn.com

Search Bloomberg Sign In

Technology

Amazon Has a Top-Secret Plan to Build Home Robots

By Mark Gurman and Brad Stone

April 23, 2018, 7:00 AM EDT *Updated on April 23, 2018, 11:22 AM EDT*

- Prototypes can navigate from room to room like driverless cars
- Company hopes to start testing bots in homes later this year

Advertisement 0:12

THE CIO'S GUIDE TO AUTOMATION, AI, AND ROBOTICS

USA TODAY NEWS SPORTS LIFE MONEY TECH TRAVEL OPINION 61° CROSSWORDS VIDEO GRATEFUL SUBSCRIBE MORE

TALKING TECH BUZZ VIDEO PODCASTS NEWSLETTER

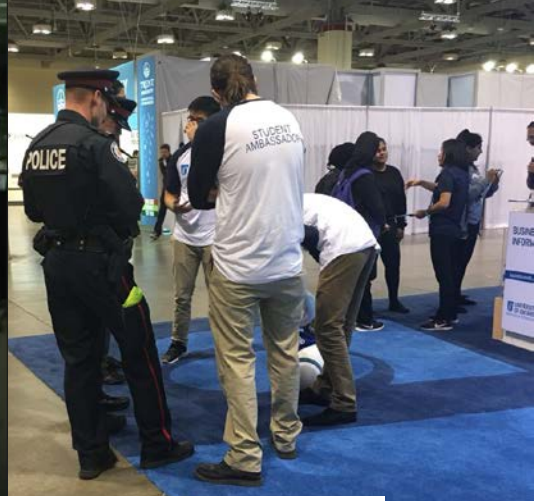
Amazon is working on a live-in robot named Vesta, says report

Shelby Fleig Published 2:19 p.m. ET April 23, 2018 | Updated 3:20 p.m. ET April 23, 2018

Amazon unveils 'Jetsons'-like roaming robot for the home

Senior Vice President, Devices & Services, Dave Limp introduces Astro on Tuesday.
Jamie McCarthy / Getty Images

Source: https://www.boston.com/news/technology/2021/09/29/amazon-robot-astro/



An ado
@Gam
@hciga

Lennart Nacke shared a post.
Thursday at 19:52 ·

Awesome visit today from Patrick and his students showing their robots.

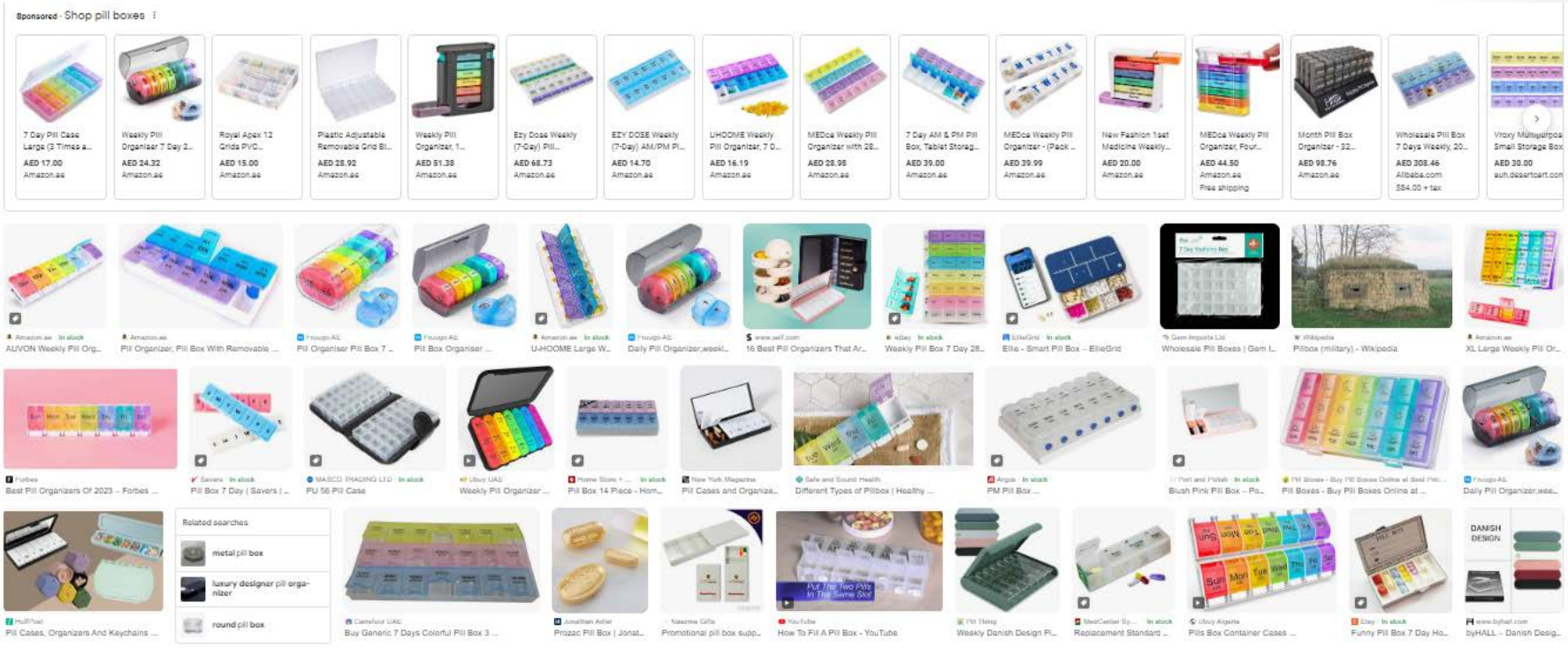
HCI Games Group
Thursday at 18:49 ·

Patrick Hung and his students from UOIT visits The Games Institute - University of Waterloo.

Toronto News, 2019

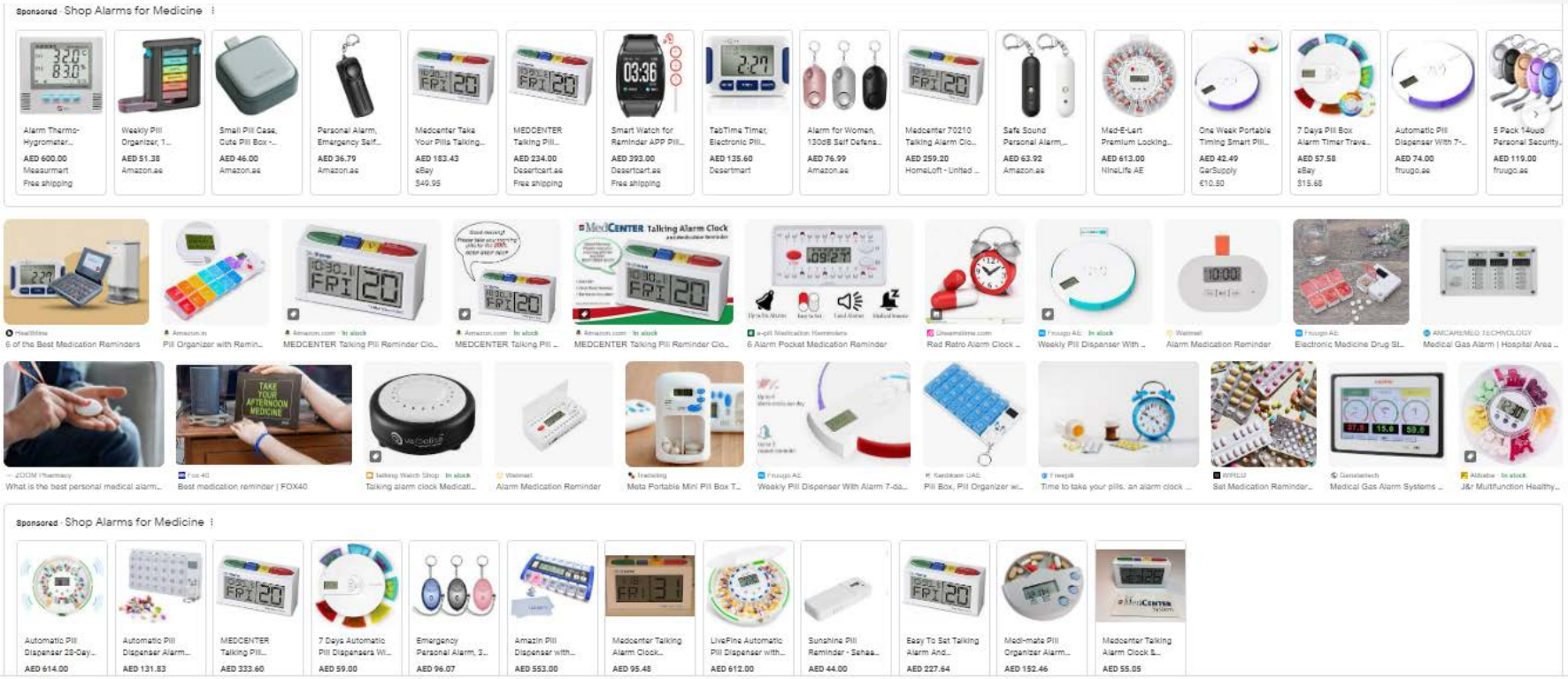
UKM, Malaysia; Zayed University, UAE

Pill boxes



Source: https://www.google.com/search?q=pill+boxes

Alarms



Source: https://www.google.com/search?q=Alarms+for+Medicine

Mobile apps

MyTherapy Pill Reminder
MyTherapy
4.9★

TakeYourPills Pill Reminder
Take Your Pills
4.7★

Medisafe Pill & Med Reminder
Medisafe®
4.7★

Medication Reminder & Tracker
MedicaApp

Medicine Reminder Pill Tracker
Living Maples

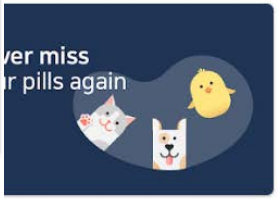
Pillo - Med Reminder & Tracker
Reminder Lab

Pill Reminder Tracker for Meds
CareClinic Tracker & Reminder

Pill & medication reminder
Whisper Arts

Cute Pill: Medication Reminder
Futasaji LLC

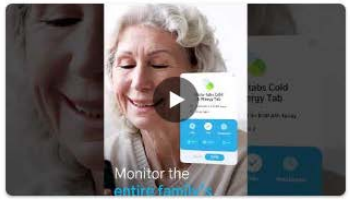
My Pill Reminder - Medication
Water Tracker Reminder



Pill Reminder Max - nutrition
rtify Inc.

MedControl Pill Reminder
Healthy Reminder
4.5★

Alarm and pill reminder
caiocrol
4.6★



Meds & Pill Reminder: CareAide
CaringUp

Source: https://play.google.com/store/search?q=pill+reminder&c=apps

Mobile apps (cont.)

UAE

UAE | WEEKEND | GULF | MENA | WORLD | BUSINESS | OPINION | CLIMATE | HEALTH | LIFESTYLE | ARTS & CULTURE | TRAVEL | SPORT | PODCASTS

Courts | Government | Education | Heritage | Health | Transport | Science | Megaprojects | Expo City Dubai | UAE in Space

Forget to take your medication? UAE students develop reminder app

Smartphone app helps remind people to take their medication on time and improves communication with pharmacies.

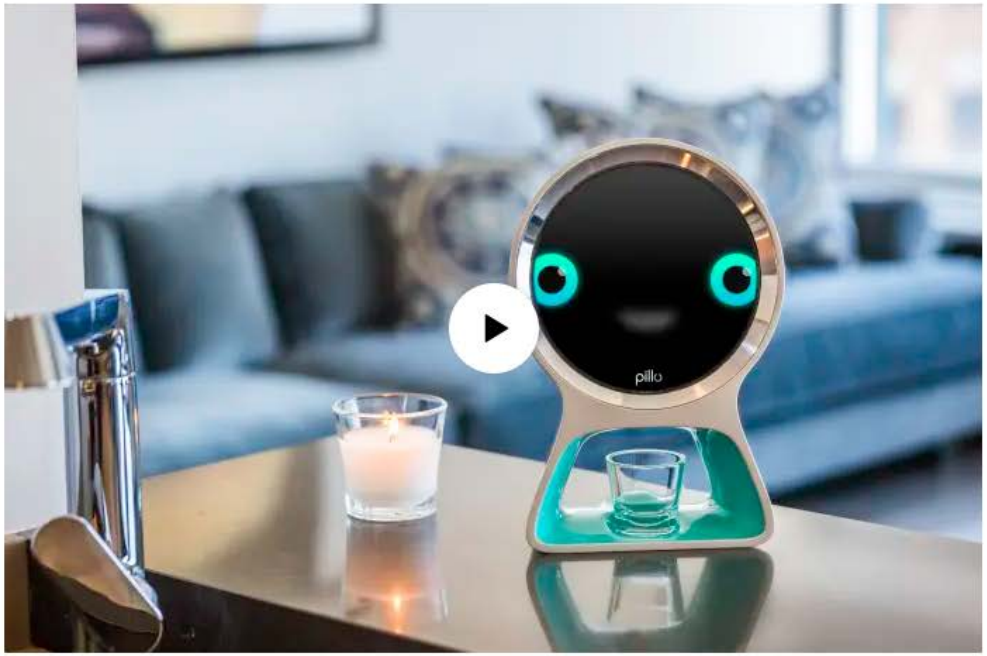
Dubai Police want traders in fake medication to face the death penalty. Philip Cheung / The National

Nick Webster
Sep 15, 2017

Listen in English | Listen in Arabic

Source: https://www.thenationalnews.com/uae/forget-to-take-your-medication-uae-students-develop-reminder-app-1.628767

Home Robot - Example



The unit itself is $499. But even if you can swallow that cost, you also have to pay a $39.99 monthly subscription which is crazy spendy. Still interested? Head over to pillohealth.com for more info. 2 Jan 2019

The Gadgeteer
https://the-gadgeteer.com › News

CLOSED

Pillo: Your Personal Home Health Robot

The smartest and friendliest way to manage yours and your family's health!

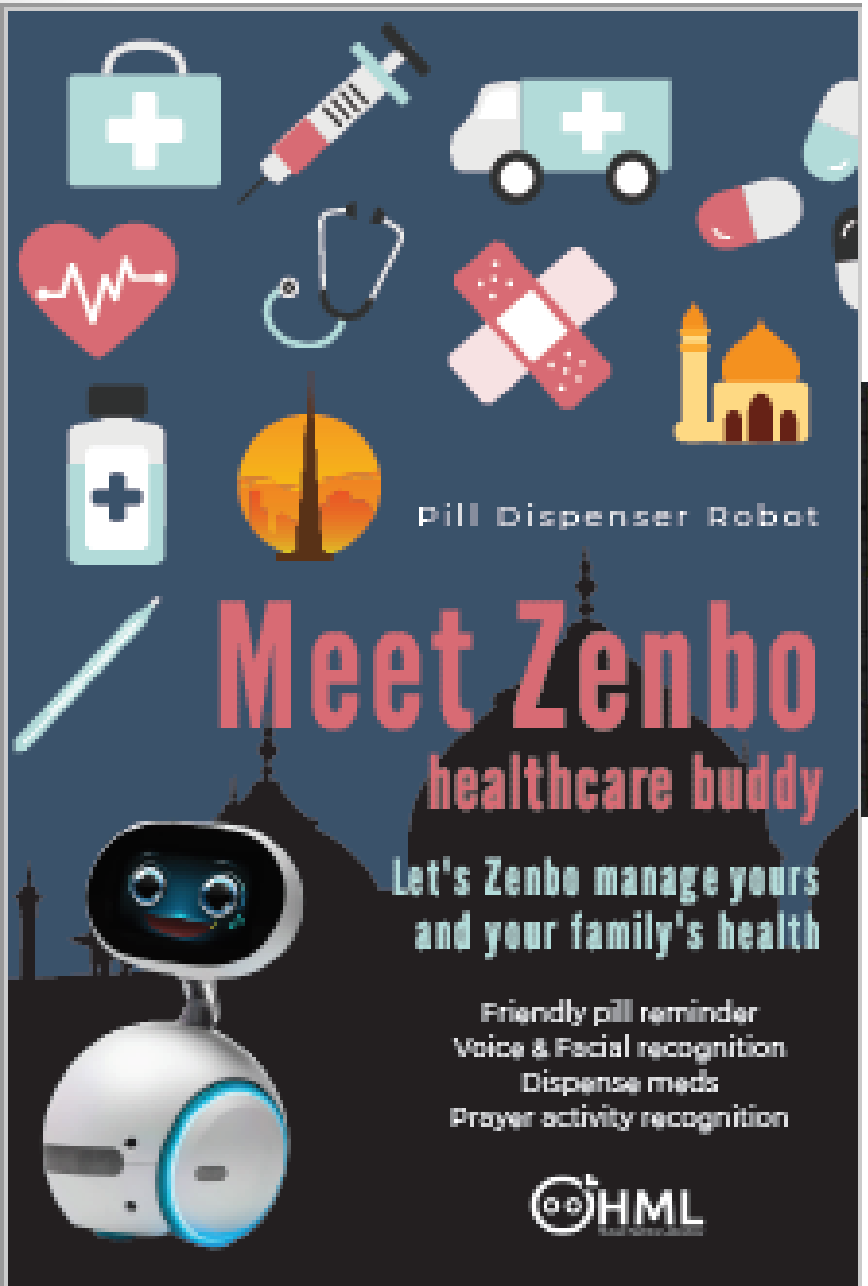
Pillo Health
1 Campaign | New York, United States

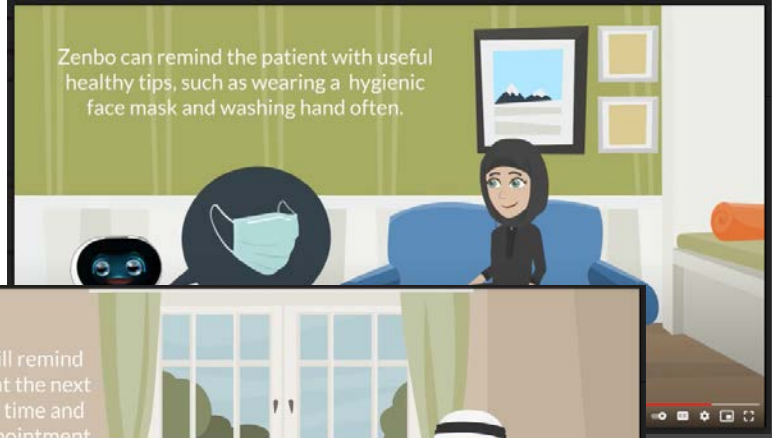
434,345 AED by 315 backers

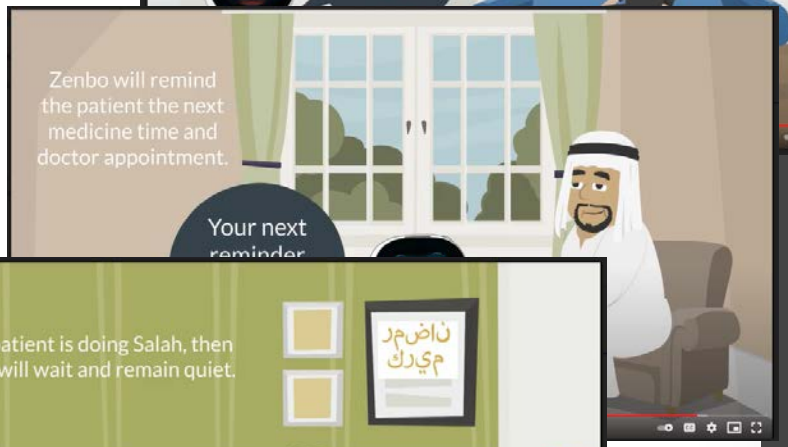
370,883 AED by 273 backers on Aug 6, 2016

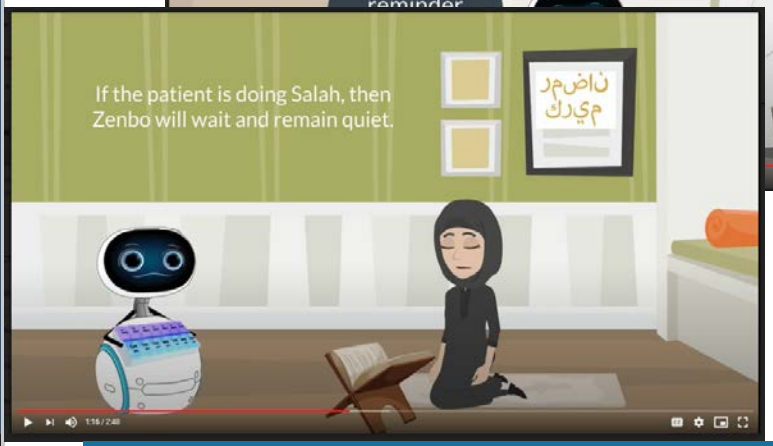
Source: https://www.indiegogo.com/projects/pillo-your-personal-home-health-robot#/

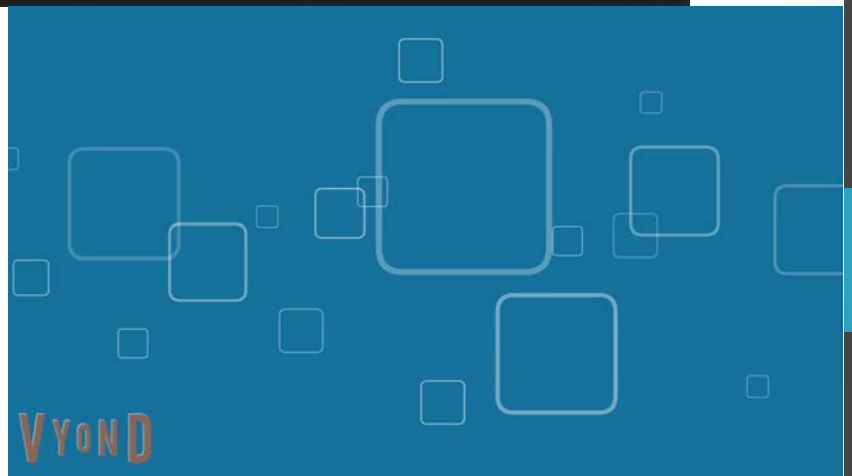
Current Research











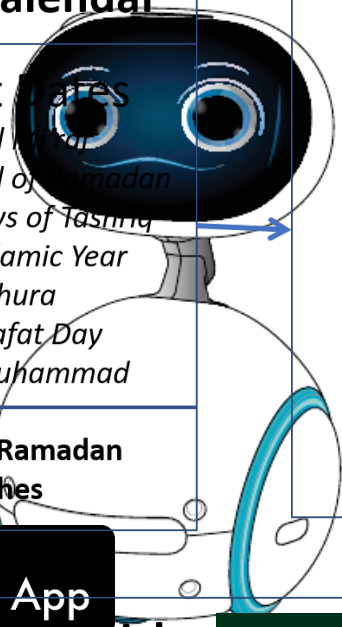
The HIJRI Calendar

Important Dates

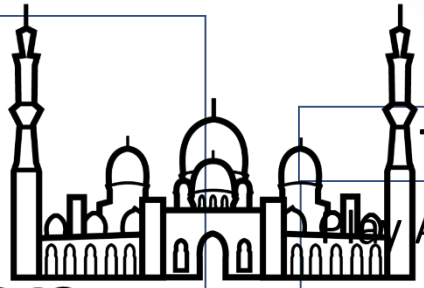
Al Isra'a Wal Mi'raj
Eid Ul Fitr: The End of Ramadan
Eid Al Adha + Days of Tashriq
Al Hijri: New Islamic Year
Day of Ashura
Wuquf in' Arafat Day
Maulid Nabi Muhammad

The Month of Ramadan Approaches

GET OUR
Android App



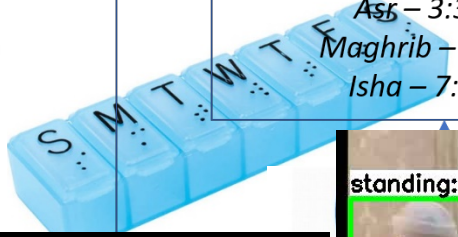
Quran



The Adhan

play Athan for Prayer

Fajr - 4:56 am
Dhuhr – 12:13 pm
Asr – 3:38 pm
Maghrib – 6:12 pm
Isha – 7:42 pm

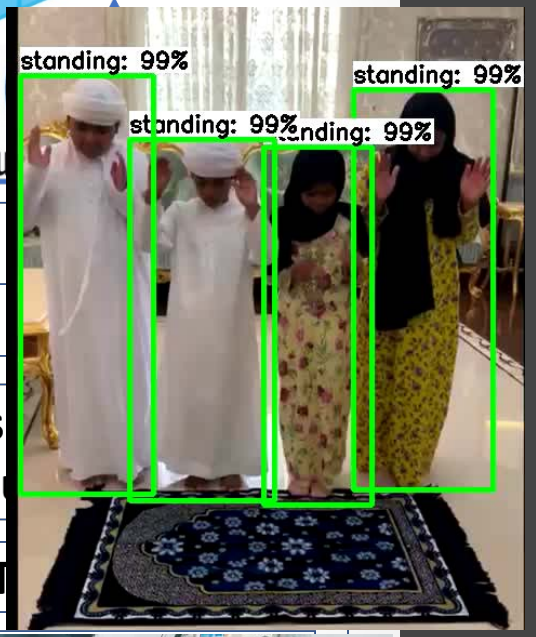


Islam rr

Humanoid R

Time tracki
Alarm trigge

Input:
1. Room value
2. Press START



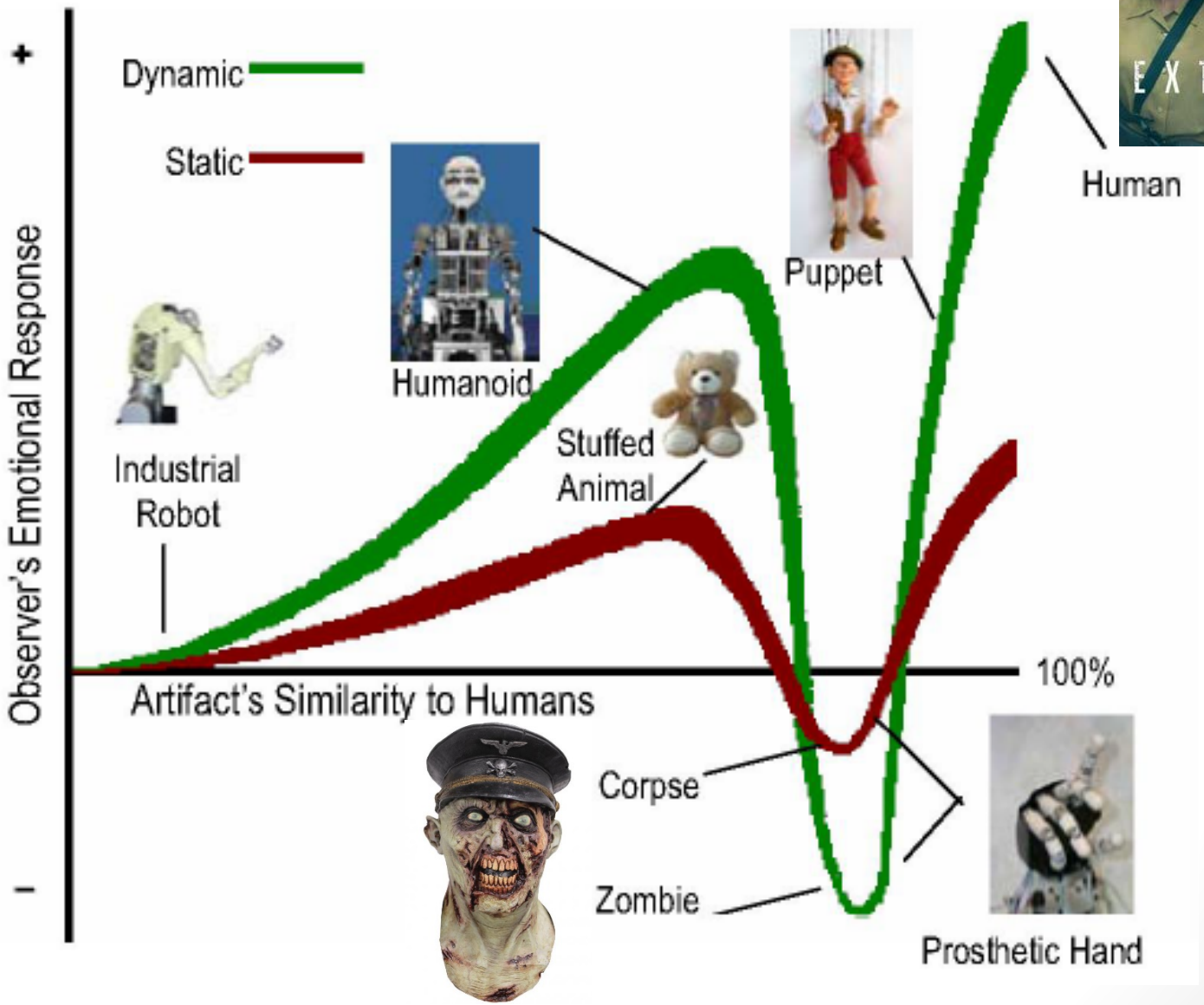
FUTURE

What is BBC Future? Follow the Food Future Planet 100 Year Life Best of... Japan 2020 Latest More

Robots: Is the uncanny valley real?

Source: https://www.bbc.com/future/article/20130901-is-the-uncanny-valley-real

The Uncanny Valley



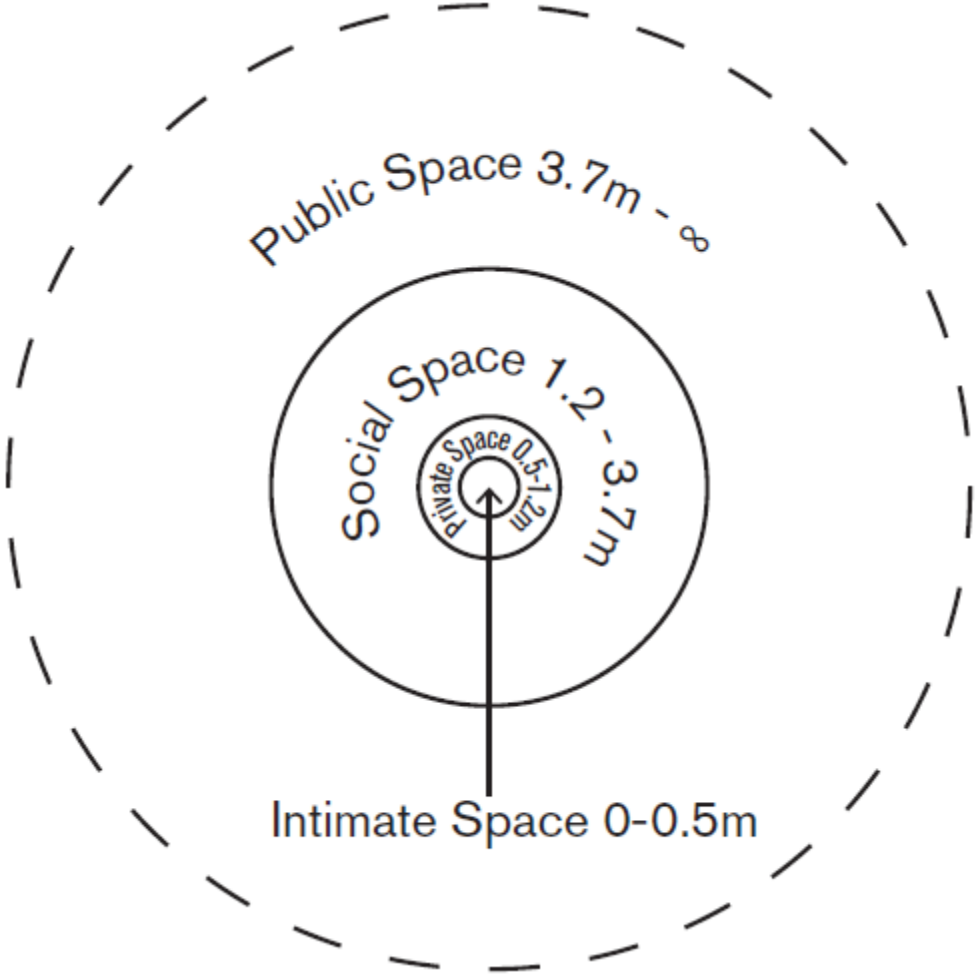
Reference:
M. Mori, K. F. MacDorman, and N. Kageki, "The uncanny valley," Robotics & Automation Magazine, IEEE, vol. 19, no. 2, pp. 98–100, 2012

Source: Google Images

AUthentic Robotic Assistant (AURA)

Prof. Ruth Stock-Homburg
Department of Marketing & Personal Management
Technische Universität Darmstadt, Germany

Psychological Closeness between People



Source: Christoph Bartneck, Tony Belpaeme, Friederike Eyssel, Takayuki Kanda, Merel Keijsers, and Selma Šabanović, "Human-Robot Interaction: An Introduction," ISBN:9781108676649, Cambridge University Press, February 2020. DOI:https://doi.org/10.1017/9781108676649

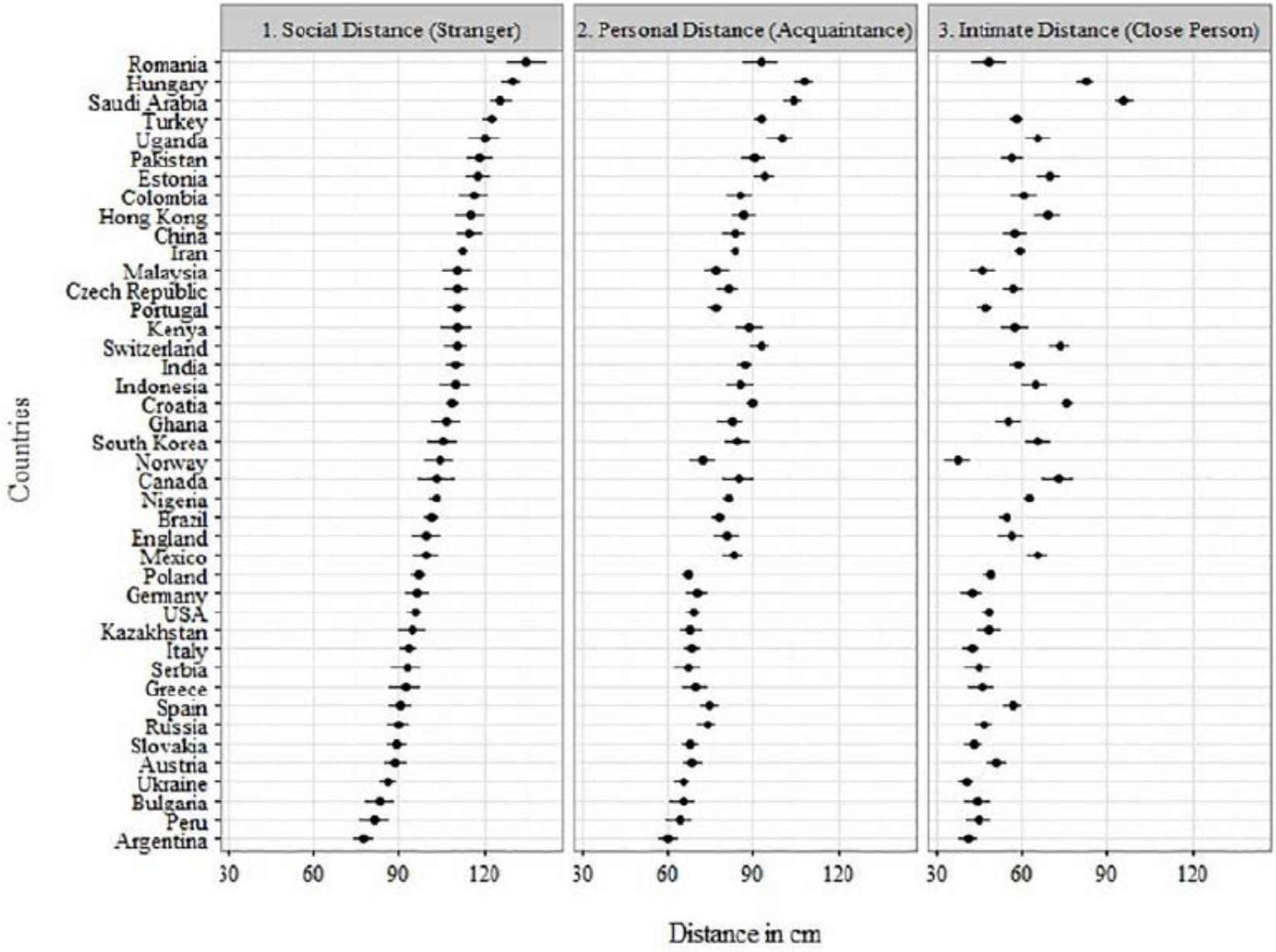


Figure 2. Mean values (cm) of social, personal, and intimate distance across all nations.
(Adapted from: Sorokowska et al., "Preferred Interpersonal Distances: A Global Comparison," Journal of Cross-Cultural Psychology, Volume 48, Issue 4, 2017, pp. 577–592)

Mastercard's Pepper at Prague Airport

www.prg.aero

8 Basic Emotions

And the purpose of each one

Anger
To fight against problems

Fear
To protect us from danger

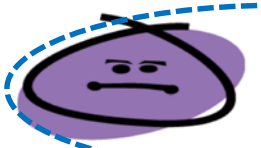
Anticipation
To look forward and plan

Surprise
To focus us on new situations

Joy
To remind us what's important

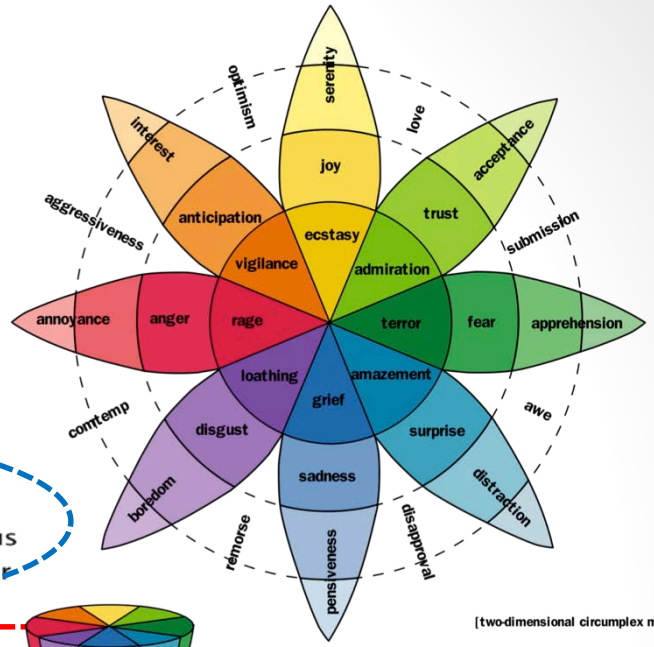
Sadness
To connect us with those we love

Trust
To connect with people who help

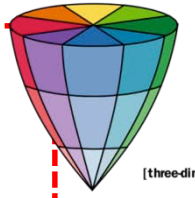


Disgust
To reject what is unhealthy

Plutchik's Wheel of Emotions



[two-dimensional circumplex model]



[three-dimensional circumplex model]

Pessimistic/Negative

Optimistic/Positive

Adopted from: https://www.6seconds.org/2017/04/27/plutchiks-model-of-emotions/

Colours in Different Cultures

Colour / Culture	Red	Blue	Green	Yellow	White
Anglo	Danger	Strong; reliable	Success Green	Coward	Purity
French	Aristocrat	Freedom; peace	Crime	Lucky; temporary	Neutral
Chinese	Happy; Success	Heaven	Cuckoldry	Wealthy; powerful	Death; purity
Japanese	Anger; danger	Villain	Young; energetic	Grace; nobility	Happy; Success
Arab	Death	Virtue	Fertile	Wealthy	Joy
Indian	Life	---	Islam	Success	Death

The Wizard of Oz "AI"

- Researchers commonly rely on the Wizard-of-Oz (WoZ) technique.
- WoZ involves deceiving study participants into thinking the robot is behaving autonomously, when it is actually being operated by a member of the research team.
- Research participants should then be informed about this deception in a post-experimental debriefing.
- Using WoZ, researchers can "pretend" that their robot has interactional skills that it does not have, either because they require further technical development or because additional time or skill must be expended on programming the robot.
- The WoZ approach is particularly suitable in situations in which technology has developed to a degree at which it is almost usable for HRI, such as speech recognition.

Source: Google Images

Involving seniors in developing privacy best practices: Towards the development of social support technologies for seniors

Organization

Ontario Tech University (University of Ontario Institute of Technology)

Published

2020

Project Leader(s)

Andrea Slane, Isabel Pedersen and Patrick C. K. Hung

Project deliverables are available in the following language(s):

English

The following project deliverables are available at Decimal Lab:

- Andrea Slane, Isabel Pedersen, and Patrick C. K. Hung. Good Privacy Practices for Developing and Marketing Social Support Technologies for Seniors, July 2020.
- Andrea Slane, Isabel Pedersen, and Patrick C. K. Hung. Involving Seniors in Developing Privacy Best Practices: Toward Responsible Development of Social Technologies for Seniors, Report of the Findings, 25 March 2020.
- Andrea Slane, Isabel Pedersen, and Patrick C. K. Hung. Involving Seniors in Developing Privacy Best Practices: Toward Responsible Development of Social Technologies for Seniors, Privacy Best Practices, 25 March 2020.
- Andrea Slane, Isabel Pedersen, and Patrick C. K. Hung. Involving Seniors in Developing Privacy Best Practices: Toward Responsible Development of Social Technologies for Seniors, Scan of Social Support Technologies, 25 March 2020.

Ontario, Canada

- Cooperating with Dr. Andrea Slane and Dr. Isabel Pederson, Faculty of Social Science and Humanities, Ontario Tech University, Canada
- Involving Seniors and Caregivers in Developing Privacy Best Practices: Toward Responsible Development of Social Support Technologies for Seniors
- The first experiment was conducted in Ontario in July 2019.
- Method: Focus Groups
- Oshawa (N=11; 2m, 9f)

Partial Insights: Attitudes towards Social Robots

- Worried about privacy and unwanted advertising
- Don't see themselves as the target customers
- Worried about setting the robots up
- Worried about losing their abilities
- Can't imagine having a conversation with the robot
- Can see useful functions

- Source:
  - Involving seniors in developing privacy best practices: Towards the development of social support technologies for seniors
    - https://www.priv.gc.ca/en/opc-actions-and-decisions/research/funding-for-privacy-research-and-knowledge-translation/completed-contributions-program-projects/2019-2020/p_2019-20_03/
  - Ezer N., Fisk A.D., Rogers W.A. (2009) Attitudinal and Intentional Acceptance of Domestic Robots by Younger and Older Adults
  - Smarr, CA., Mitzner, T.L., Beer, J.M. et al. Int J of Soc Robotics (2014) 6: 229.

Sao Paulo, Brazil

1. Quiz
2. Aerobics
3. Christmas dance

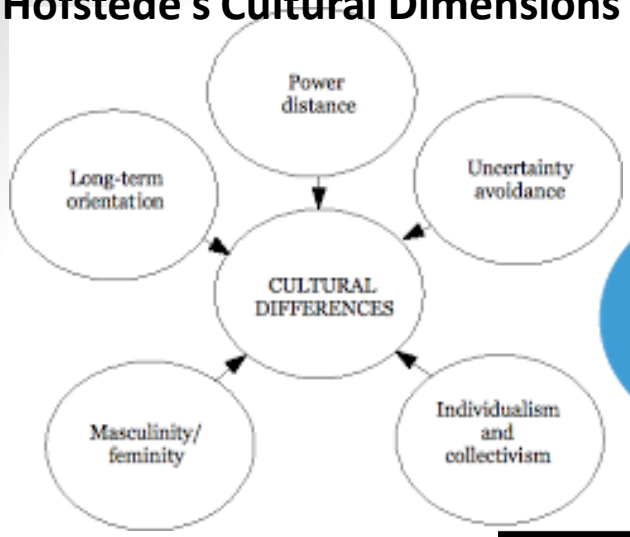
Participants

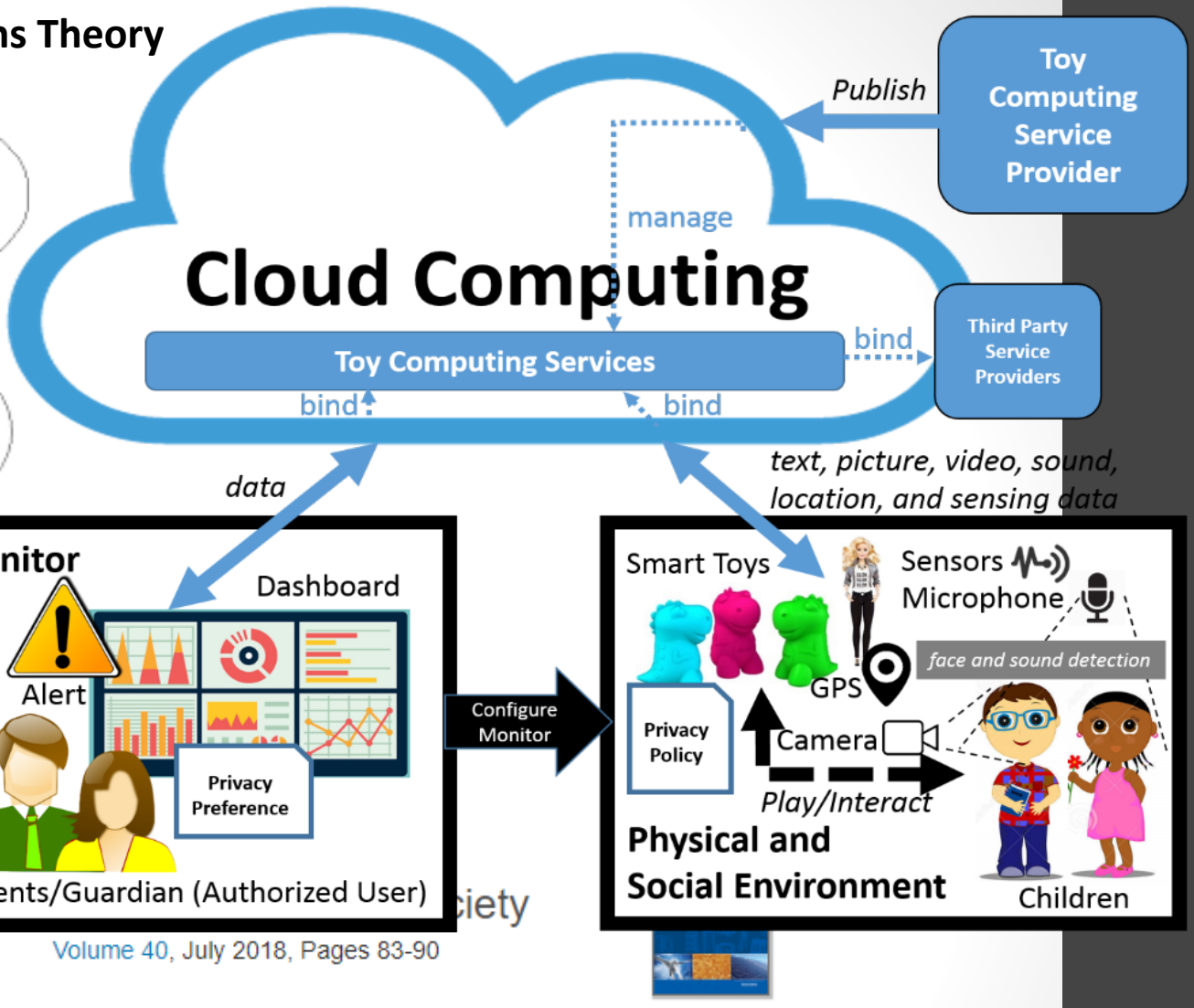
- Cooperating with Prof. Marcelo Fantinato and Prof. Sarajane Marques Peres from the School of Arts, Sciences and Humanities, University of São Paulo, Brazil
- Two focus groups (9 + 11)
- Seniors' open university: students and colleagues
- Collaboration of three gerontologists

Partial results

- Most participants showed to enjoy interaction with the robots.
- Many of the participants wanted to interact with the robot, even more than our activities allowed.
- Some just watched from afar, but apparently because of their shy personality and not for aversion to the robot (mostly men).
- Most participants agreed that company robots could help them with everyday activities.
- Some participants highlighted some points of concern:
  - Companion robots cannot replace a companion human.
  - Companion robots can make elderly people even more dependent.

Hofstede's Cultural Dimensions Theory





Source: Google Images

ELSEVIER
Volume 40, July 2018, Pages 83-90

A preliminary study of Hello Barbie in Brazil and Argentina

Marcelo Fantinato [a], Patrick C.K. Hung [b], Ying Jiang [b], Jorge Roa [c], Pablo Villarreal [c], Mohammed Melaisi [b], Fernanda Amancio [a]

Doctor Who - Companion K9

News > Scottish News

DOG-TER WHO Doctor Who superfan gives faithful robot dog K9 21st century upgrade for Abertay University project

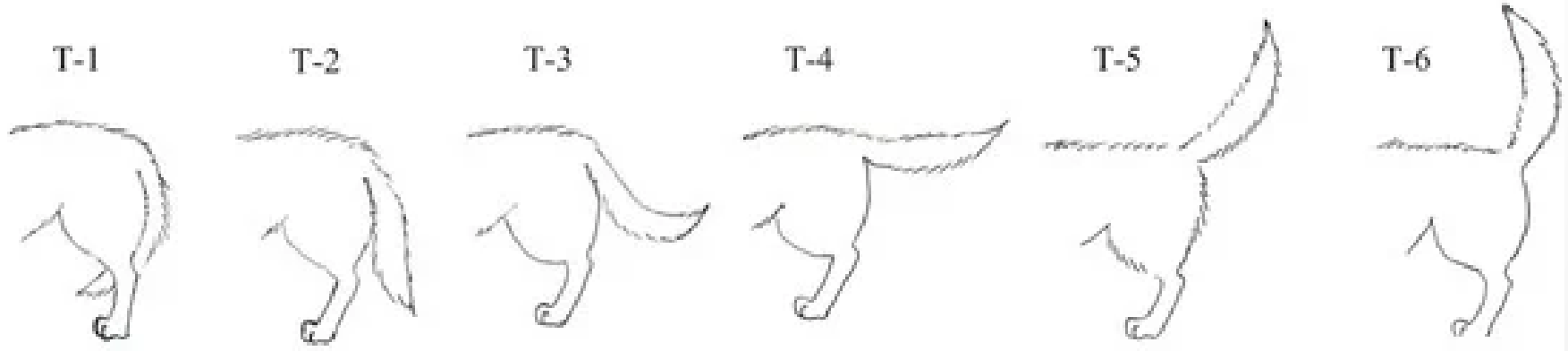
The iconic robot, which featured in the hit sci-fi series with multiple Doctors including Scottish starDavid Tennant, has been given a new lease of life from Gary Taylor

By David Fowler
13:34, 9 May 2018 | Updated: 13:45, 9 May 2018

THE SCOTTISH Sun

Source: The Scottish Sun & Google Images

Tail:	T-1	Tail is between the legs
	T-2	Tail is hanging down
	T-3	Tip of the tail is lower than the height of the back
	T-4	Tail is parallel to the back
	T-5	Tail is higher than the height of the back
	T-6	Tail is up almost vertically

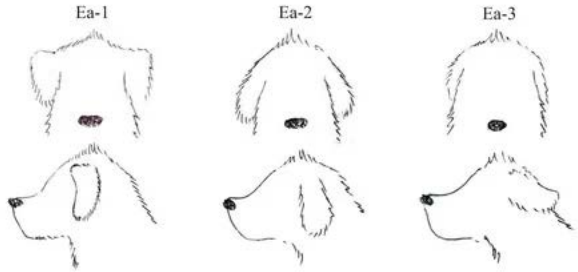


Source: Hasegawa, M., Ohtani, N., and Ohta, M. (2014). Dogs' Body Language Relevant to Learning Achievement, Animals 2014, 4(1), 45-58; https://doi.org/10.3390/ani4010045.

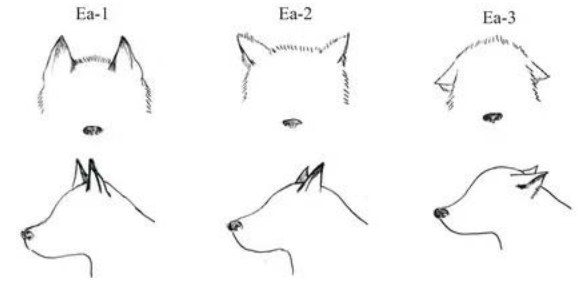
Future Works:
Four-Legged Animals

Ears:	Ea-1	Ears are turned forward
	Ea-2	Ears are slightly turned back
	Ea-3	Ears are turned back

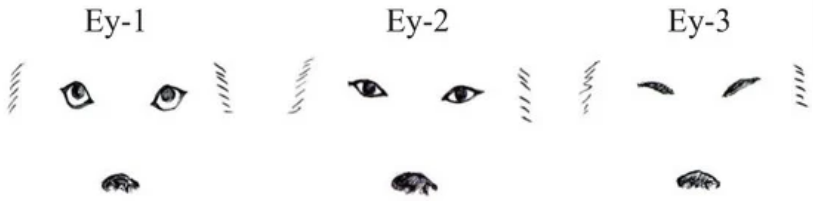
< Drop ear >



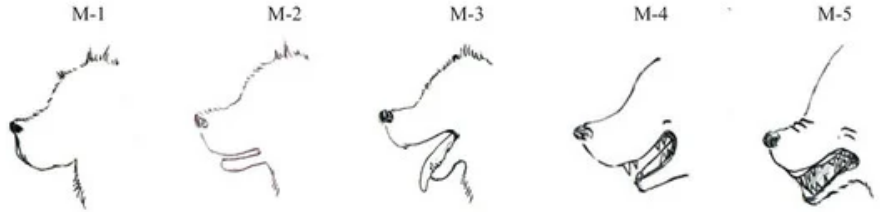
< Prick ear >



Eyes:	Ey-1	Eyes open wide
	Ey-2	Eyes open normally
	Ey-3	Eyes narrow



Mouth:	M-1	Mouth shut
	M-2	Mouth slightly open
	M-3	Mouth opens wide and the tongue is visible
	M-4	Mouth opens, the teeth are visible, and the cheek muscles look firm
	M-5	The front and back teeth are visible, and the look is obviously aggressive



Source: Hasegawa, M., Ohtani, N., and Ohta, M. (2014). Dogs' Body Language Relevant to Learning Achievement, Animals 2014, 4(1), 45-58; https://doi.org/10.3390/ani4010045.

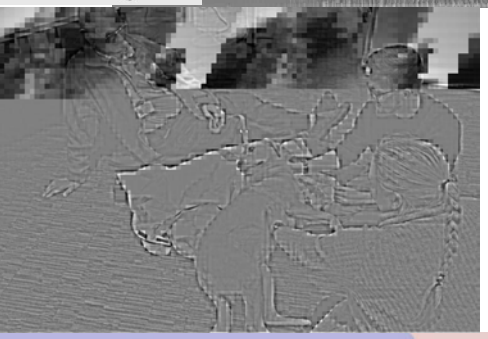
Turn it into a Scottish Terrier

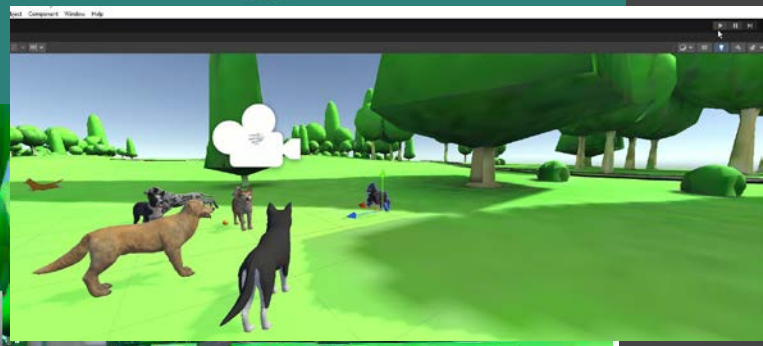
Source: Google Images

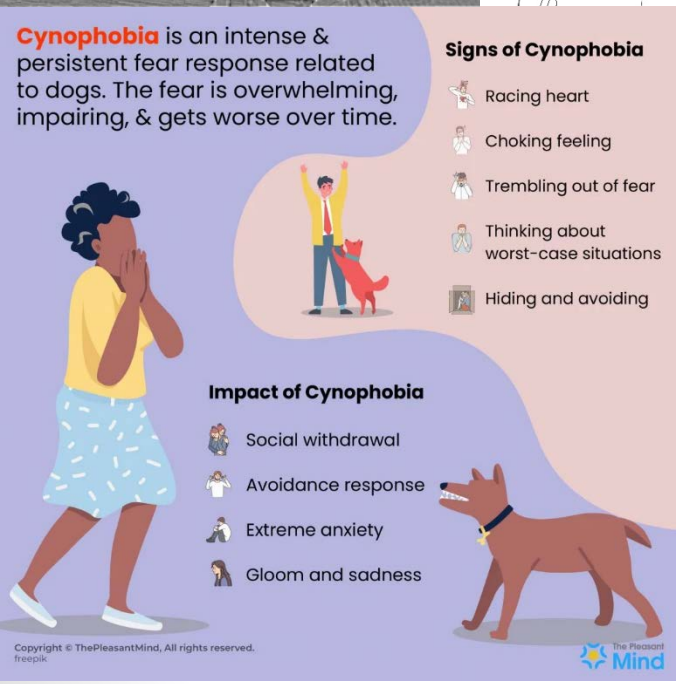
Robot-To-Robot Interaction (RRI)

18 November 2019

Doting dogs give Abertay students a calming canine cuddle





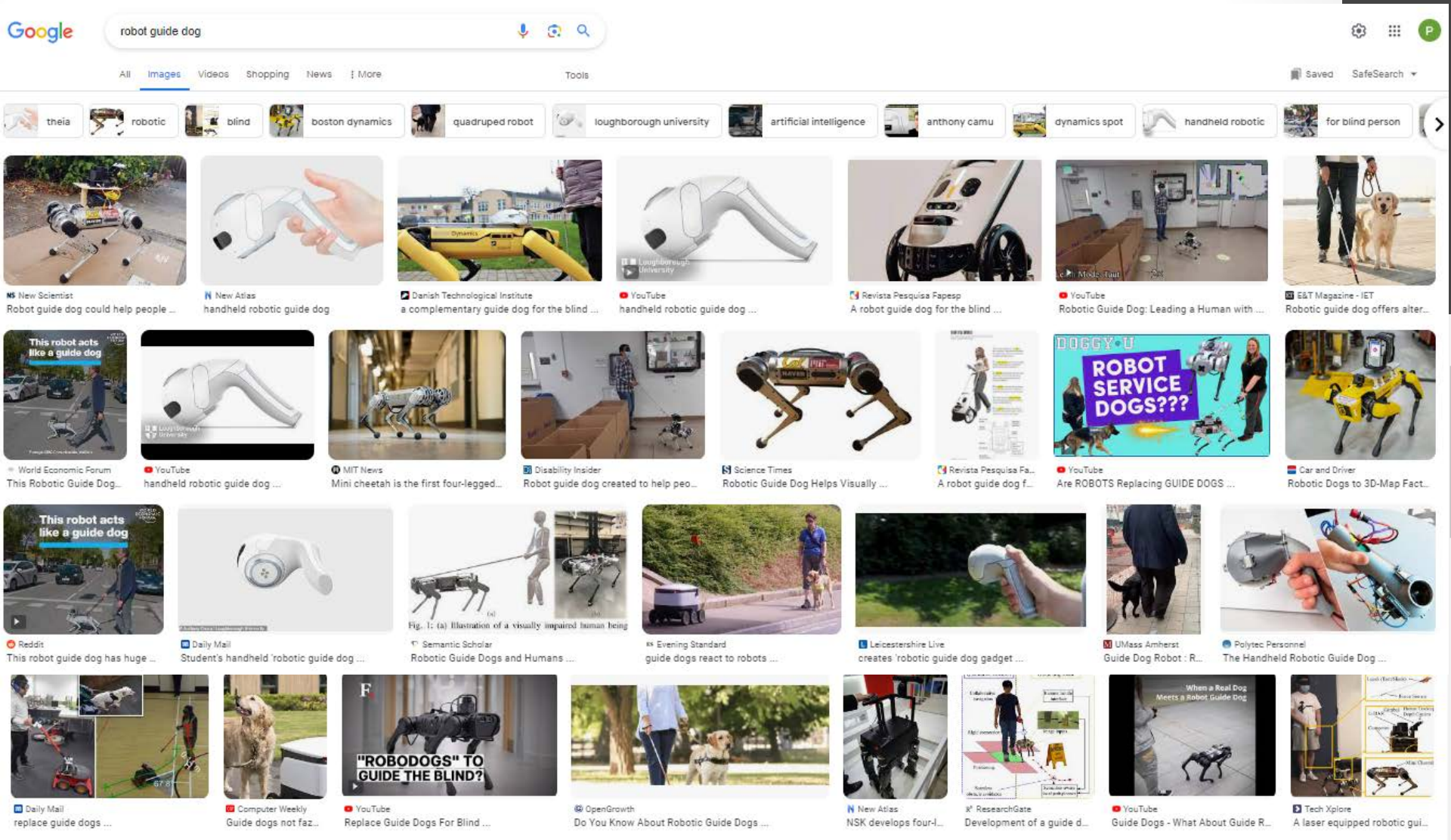


Source: Abertay University & Google Images

国立大学法人
静岡大学
National University Corporation
Shizuoka University

roto
roto
PARAMO

Google Images "Robot Dog"

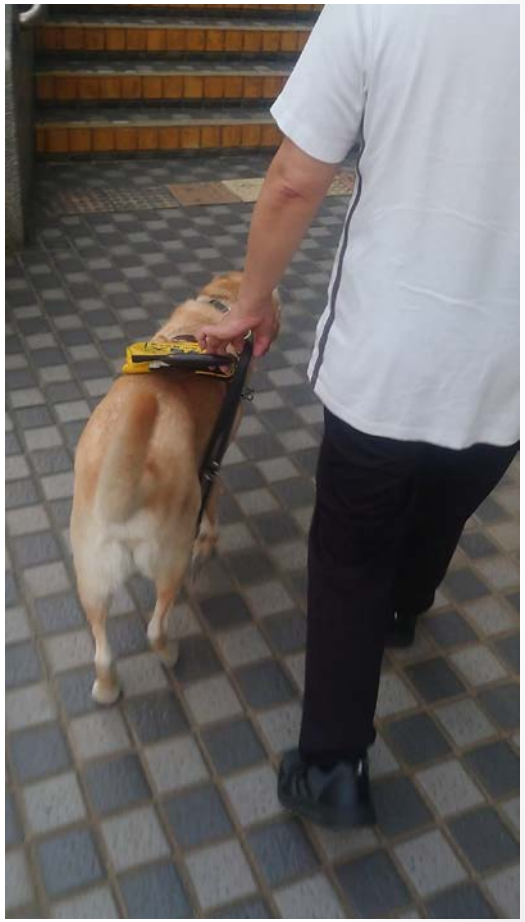


Design Principles

There are six design principles.

1. A robot dog is **NOT to replace a real guide dog** as a companion to the visually impaired persons.
2. A robot guide dog **should behave like a real dog**. For example, a robot dog should not speak human language.
3. Besides the functional requirements such as navigations, we should also focus **on the non-functional requirements** such as the Uncanny Valley, Human-robot Interaction (HRI), emotion engagement and attachment.
4. The robot guide dog should **provide haptic feedback** to the visually impaired persons such as body gestures and movement.
5. We only apply the concept of robot guide dog as **an assistive technology** (e.g., a tool) for training the guide dog owners.
6. We should also provide **an open programming platform** for the visually impaired persons to do coding on the robot dog to customize their special needs.

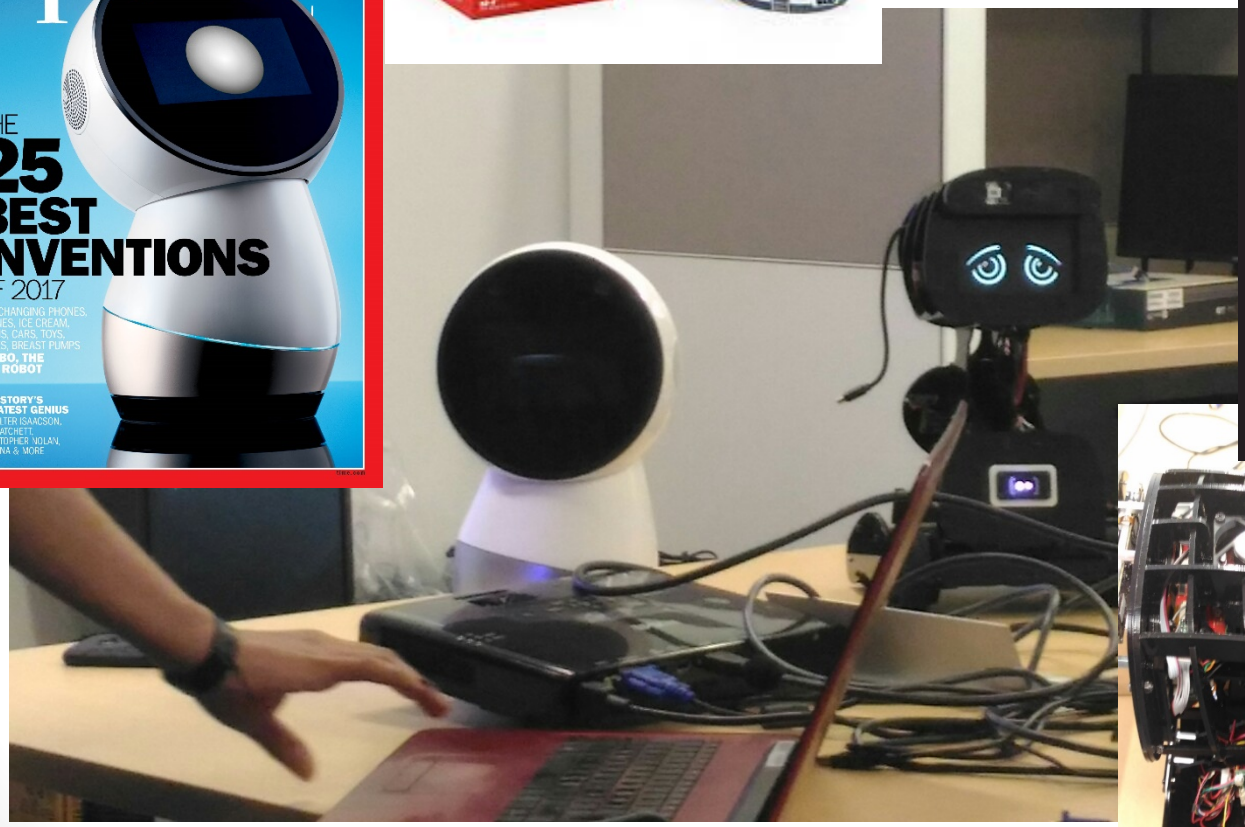
Climb stairs and avoid obstacles



Study in Taiwan

Study in Canada

Thank you for your listening!



patrick.hung@ontariotechu.ca