So very THANKFUL

KACST

King Abdul Aziz City for Science and Technology

For funding 2 Million SAR for this research project.

وحدة العلوم والتقنية
Science & Technology Unit

Science and Technology Unit

For helping in executing this project.

OMICS International

GIS INNOVATION CENTER
مركز الابتكار التقني لنظم المعلومات الجغرافية

GIS Technology Innovation Center

For helping and executing this project.

College of Computer and Information System

For helping and executing this project.

AdvancedMedia Laboratory
http://advancedmedialab.com/

Dr. Abdulmotaleb El Saddik
FIEEE, FEIC, FCAE Distinguished Professor
University Research Chair,
University of Ottawa, CANADA

Dr. Mohamed Ridza Wahiddin
Deputy Rector (RESEARCH AND INNOVATION),
International Islamic University,
MALAYSIA.

Dr. Mohamed Bouri
Group Leader, Rehabilitation and Assistive Robotics in the Laboratory of Robotic Systems,
EPFL (Swiss Federal Institute of Technology), SWITZERLAND

Dr. Ahmed Lbath
University of Grenoble – Joseph Fourier LIG Lab (Laboratoire d'Informatique de Grenoble)
FRANCE

AdvancedMedia Laboratory
http://advancedmedialab.com/

So very THANKFUL

Medical Collaboration

DR. ASAD H. TOONSI,
FRCP. CONSULTANT, PEDIATRICIAN AND INFECTIOUS DISEASES, MATERNITY AND CHILDREN HOSPITAL, MAKKAH

DR. FAWAZ FAQIR, DR. NADIA, DR. SHABANA
DISABLED CHILDREN HOSPITAL, MAKKAH

DR. FAROOQUE,
AL-NOOR HOSPITAL, MAKKAH

About PROJECT

Funded by KACST National Science, Technology and Innovation Plan (NSTIP)

Project started in January 2013

Dr. Abdulmotaleb El Saddik (Ottawa, Canada)

Dr. Md. Abdur Rahman

Dr. Saleh Basalamah

Investigator Team

AdvancedMedia Laboratory
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About PROJECT

Researchers - PhD Students

Dr. Abdullah Murad
Post-Doc Fellow

Ahmad Muaz Qamar

Faizan-ur-Rehman

Akhlaq Ahmad

Bilal Sadiq

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About PROJECT

Publications (2014-2015) Conference – (8)

2015

1. Faizan Ur Rehman, Ahmed Lbath, Abdullah Murad, Md. Abdur Rahman, and Saleh Basalamah "A Semantic Geo-Tagged Multimedia-Based Routing in a Crowdsourced Big Data Environment", ACM International Conference on Multimedia (**ACM Multimedia 2015**), 26 - 30 October 2015, Brisbane, Australia.
2. Akhlaq Ahmad, Md. Abdur Rahman, Ridza Wahiddin, Abdullah Murad, Md. Abdur Rahman, and Saleh Basalamah "i-Diary: A Crowdsource-based Spatio-Temporal Multimedia Enhanced Points of Interest Authoring Tool", ACM International Conference on Multimedia (**ACM Multimedia 2015**), 26 - 30 October 2015, Brisbane, Australia.
3. Ahmad Qamar, Faizan Ur Rehman, Ahmed Lbath, Abdullah Murad, Md. Abdur Rahman, and Saleh Basalamah "A Multi-sensory Gesture-Based Login Environment", ACM International Conference on Multimedia (**ACM Multimedia 2015**), 26 - 30 October 2015, Brisbane, Australia.
4. Bilal Ahmed, Faizan Ur Rehman, Ahmed Lbath, Abdullah Murad, Md. Abdur Rahman, and Saleh Basalamah "Crowdsourced Multimedia Enhanced Spatio-temporal Constraint Based on-Demand Social Network for Group Mobility", ACM International Conference on Multimedia (**ACM Multimedia 2015**), 26 - 30 October 2015, Brisbane, Australia.

About PROJECT

Publications (2014-2015) Conference – (8)

2015

5. Ahmad Muaz Qamar, Ahmed Riaz Khan, Syed Osama Husain, Md. Abdur Rahman, and Saleh Basalamah "A Multi-Sensory Gesture-Based Occupational Therapy Environment for Controlling Home Appliances", ACM International Conference on Multimedia Retrieval (**ACM ICMR** 2015), June 23-26, Shanghai, China

6. Akhlaq Ahmad, Md. Abdur Rahman, Mohamed Ridza Wahiddin, Saleh Basalamah, Bilal Sadiq and Shady Mohammed, "Visualization of a Scale Free Network in a Smartphone-based Multimedia Big Data Environment", IEEE International Conference on Multimedia Big Data (**IEEE BigMM** 2015), Beijing, China, April 20-22, 2015.

7. Ahmad Muaz Qamar, Dr. Mohamed Abdur Rahman, Syed Osama Hussain, Bilal Sadiq, Ahmed Riaz Khan and Saleh Basalamah, "A Multimedia Big Data E-Therapy Framework", IEEE International Conference on Multimedia Big Data (**IEEE BigMM** 2015), Beijing, China, April 20-22, 2015.

8. Akhlaq Ahmad, Imad Afyouni, Abdullah Murad, Md. Abdur Rahman and Mohamed Ridza Wahiddin, " Quality and Context-Aware Data Collection Architecture from Crowd-Sourced Data", **IEEE IMTIC** '15, February 11-13, 2015.

About PROJECT

Publications Journal– (8), Conference– (11)

2014

- Md. Abdur Rahman, "i-Therapy: A non-Invasive Multimedia Authoring Framework for Context-Aware Therapy Design", MULTIMEDIA TOOLS AND APPLICATIONS, Springer US, DOI - 10.1007/s11042-014-2376-5, December 2014. (ISI- Index: 1.014).
- Md. Abdur Rahman, M. Shamim Hossain, and Abdulmotaleb El Saddik, "Context-Aware Multimedia Services Modeling: An e-Health Perspective", MULTIMEDIA TOOLS AND APPLICATIONS, Springer, Vol. 73, No. 3, pp. 1147-1176, November 2014, DOI: 10.1007/s11042-013-1595-5. (ISI-Index: 1.014)
- Md. Abdur Rahman, " Multi-Sensor Serious Game-Based Therapy Environment for Hemiplegic Patients", International Journal of Distributed Sensor Networks, Advances in Multimedia Sensor Networks for Health-Care and Related Applications (AMS), Hindawi Publishing Corporation, Vol. 2014, Article 910482, to appear in November 2014. (ISI-Indexed: 0.72).
- Md. Abdur Rahman, Heung-Nam Kim, Abdulmotaleb El Saddik, and Wail Gueaieb. A context-aware multimedia framework toward personal social network services. Journal of MULTIMEDIA TOOLS AND APPLICATIONS. Springer US, vol. 71, no. 3, pp. 1717-1747, August 2014. Online link (UQU Affiliation).
- M. S. Hossain, A. Alghamdi, A. Alelaiwi, A. M. Ghoneim, and Md. Abdur Rahman, "QoS in Web Service-based Collaborative Engineering Education Environment", International Journal of Engineering Education Vol. 30, No. 3, pp. 618–624, 2014 [ISI-Indexed: 0.4].
- Md. Abdur Rahman, Mohamed Ahmed, “Emotion-Based System for Social Media Content Processing and Event Monitoring”, Journal of Advances in Computing, Vol. 4, No. 2, 2014.
- Ghulam Muhammad, Mehedi Masud, Abdulhameed Alelaiwi, Md.Abdur Rahman, Ali Karime, Atif Alamri, M. Shamim Hossain, “Spectro-temporal directional derivative based automatic speech recognition for a serious game scenario”, MULTIMEDIA TOOLS AND APPLICATIONS, Springer US, DOI: 10.1007/s11042-014-1973-7, May 2014 [ISI-Indexed]

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2014

- Md. Abdur Rahman, "Multimedia Environment toward Analyzing and Visualizing Live Kinematic Data for Children with Hemiplegia", MULTIMEDIA TOOLS AND APPLICATIONS, Springer, DOI: 10.1007/s11042-014-1864-y [to be published in February 2014, CS-CIS-UQU affiliation].
- Faizan Ur Rehman, Ahmed Lbath, Md. Abdur Rahman, Saleh Basalamah, Imad Afyouni, Akhlaq Ahmad and Syed Osama Hussain, " Toward Dynamic Path Recommender System Based on Social Network Data", 7th ACM SIGSPATIAL International Workshop on Computational Transportation Science, Dallas, Texas, November 4, 2014 [CIS-UQU affiliation].
- Imad Afyouni, Faizan Ur Rehman, Ahmad Qamar, Akhlaq Ahmad, Md. Abdur Rahman and Saleh Basalamah, "A GIS-based Serious Game Recommender for Online Physical Therapy", Third International ACM SIGSPATIAL Workshop on HealthGIS (HealthGIS'14), Dallas, Texas, USA, November 4, 2014 [CIS-UQU affiliation].
- Akhlaq Ahmad, Md. Abdur Rahman, Faizan Ur Rehman, Ahmed Lbath, Imad Afyouni, Saleh Basalamah, Abdelmajid Khelil, Osama Hussain, Bilal Sadiq, Mohamed Ridza Wahiddin, "A Framework for Crowd-Sourced Data Collection and Context-Aware Services in Hajj and Umrah", 11th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA' 2014), November 10-13, 2014, Doha, Qatar, 2014 [CIS-UQU affiliation].
- Akhlaq Ahmad, Md. Abdur Rahman, Faizan Ur Rehman, Imad Afyouni, Saleh Basalamah, Mohamed Ridza Wahiddin, "Towards a Mobile and Context-Aware Framework from Crowdsourced Data", IEEE International Conference on Information and Communication Technology For The Muslims World (ICT4M), Kuching, Sarawak, Malaysia, 17-19 November 2014 [CIS-UQU affiliation]. (BEST PAPER AWARD)
- Ahmad Qamar, Imad Afyouni, Md. Abdur Rahman, Faizan Ur Rehman, Delwar Hossain, Saleh Basalamah and Ahmed Lbath, "A GIS-based Serious Game Interface for Therapy Monitoring", 22nd ACM International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2014), Dallas, Texas, USA, November 4-7, 2014 [CIS-UQU affiliation]. (BEST DEMO AWARD)

Publications

2014

- Ahmad Qamar, Imad Afyouni, Faizan Ur Rehman, Delwar Hossain, Asad Toonsi, Mohamed Abdur Rahman and Saleh Basalamah, "A Multimedia E-Health Framework Towards An Interactive And Non-Invasive Therapy Monitoring Environment", The 22nd ACM International Conference on Multimedia (ACM Multimedia), Orlando, Florida, USA, November 3-7, 2014 [CIS-UQU affiliation].
- Md. Abdur Rahman, “Multimedia Non-Invasive Hand Therapy Monitoring System”, IEEE International Symposium on Medical Measurements and Applications (IEEE MeMeA 2014), Lisbon, Portugal, June 11 – 12, 2014.
- Md. Abdur Rahman, Mohamed Ahmed, Ahmad Qamar, Delwar Hossain, Saleh Basalamah, “'Modeling Therapy Rehabilitation Sessions using Non-Invasive Serious Games”, IEEE International Symposium on Medical Measurements and Applications (IEEE MeMeA 2014), Lisbon, Portugal, June 11 – 12, 2014.
- Md. Abdur Rahman, and Saleh Basalamah, "A Multimedia non-Invasive e-Therapy Framework for Measuring Live Kinematic Data”, IEEE IHTC, Montreal, Canada, June 1-4 2014. (UQU Affiliation).
- Md. Abdur Rahman, Delwar Hossain, Ahmad M Qamar, Faizan Ur Rehman, Asad H. Toonsi, Mohamed Ahmed, Abdulmotaleb El Saddik, Saleh Basalamah, " A Low-cost Serious Game Therapy Environment with Inverse Kinematic Feedback for Children Having Physical Disability", ACM International Conference on Multimedia Retrieval (ACM ICMR 2014), Glasgow, UK, April 1-4, 2014 [ISI-Indexed].
- Ahmad M. Qamar, Md. Abdur Rahman, and Saleh Basalamah, "Adding inverse kinematics for providing live feedback in a serious game-based rehabilitation system”, IEEE ISMS, Malayasia, 27 Jan - 29 Jan 2014. (UQU Affiliation).

Awards (2)

Best Demo Award

Ahmad Qamar, Imad Afyouni, Md. Abdur Rahman, Faizan Ur Rehman, Delwar Hossain, Saleh Basalamah and Ahmed Lbath, "A GIS-based Serious Game Interface for Therapy Monitoring", 22nd ACM International Conference on Advances in Geographic Information Systems (**ACM SIGSPATIAL 2014**), Dallas, Texas, USA, November 4-7, 2014.

Best Paper Award

Akhlaq Ahmad, Md. Abdur Rahman, Faizan Ur Rehman, Imad Afyouni, Saleh Basalamah, Mohamed Ridza Wahiddin, "Towards a Mobile and Context-Aware Framework from Crowdsourced Data", IEEE International Conference on Information and Communication Technology For The Muslims World (**IEEE ICT4M 2014**), Kuching, Sarawak, Malaysia, 17-19 November 2014

About PROJECT

Patents (36)

To Umm Al Qura University and IPMO (USPTO, KSA)

- BCI (Brain Computer Interface) based VR (Virtual Reality) Therapy System for Paralyzed patients to recover muscle functions
- Therapist-Assistant: Virtual Reality based Live Augmented Skeletal Therapy Management System
- A serious game generator for disability persons based on patient disability level and/or therapist recommendation using non-invasive motion sensors
- Gestpass: a multimodal gesture-based login system for providing assisted living services to physically challenged individuals
- An electromyography (emg) signal and augmented reality based occupational hand therapy framework for people with hemiplegia
- A gesture controlled mobile based camera-less smart home management solution for providing assisted living services to physically challenged individuals with low mobility
- A non-invasive healthgis multimedia serious game therapy environment for providing ranges for motion of full-body joints to hemiplegic patient through forward and inverse kinematics
- System and method for detecting and visualizing live kinetic and kinematic data for the musculoskeletal system
- A web-based non-invasive way of detecting, tracking, recognizing and 3d visualizing live kinematic hand therapy data of hemiplegic patient
- A Synchronized Multimedia Engine for Therapy Recording, Playback, Annotation and Query in Big Data Environment

Patents (36)

- Mapping virtual 3d human model with the joint-motions of a disabled: a web-based 3d human model with natural user interface-based interaction capability for designing physical therapy
- Immersive telepresence as occupational therapy for hemiplegic patients through VR technology
- Physical Therapy with Mixed Reality
- Hajjgeocaching - a real-life massive spatio-temporal online game for pilgrims with Motor Disability·
- Multimedia-based Browsing of Clustered Multiple Points of Interests (POI) at single GPS location
- A Mobile Cloud-based Big Data Framework to Connect Pilgrims with the Doctors in a Very Large Crowd
- Spatio-temporal Context-Aware Door, Floor and Route Recommender for Performing Tawaaf & Sai and Stoning Ritual at Jamarat for Males, Females and individual with disability
- Crowd based Spatio-temporally aware Visitor Information Guide for Sightseeing
- Holographic visualization of Hajj Scenario
- Should you go for Hajj this year – A Smart Recommendation System
- A framework to maintain pilgrim social network between pilgrims and their family member and friends
- Hajjnumrah: a cloud-based context-aware hajj and umrah management system based on crowd sourced data

Patents (36)

- Vehicle-connect a smart spatio-temporal cloud-based vehicle management system for a very large and dynamic crowd
- Spatio-temporal augmented reality based system to perform rituals of hajj and Umrah in proper and easy way
- Tracking friends and vehicles spatio-temporal status using augmented reality in a very large crowd
- Autobook: A Social Network for the Vehicles
- Smart On-Road Sign Boards' Network in the Context of Smart City
- Context Aware Dynamic Road Congestion Notification and Dynamic Route Suggestions in a Very Large Crowd in the context of a Smart City
- HoloDesk: Augmented Holographic Real-time Hajj & Umrah Entities' Management System
- Automation of Dabiha or Animal Sacrifice System in the Context of Hajj Rituals: A Smart City Perspective
- Mobile Cash for Pilgrims Through Unified Prepaid Payment Card
- HoloHouse: A 3D collaborative home design environment
- Next-Generation In-store Shopping Experience through Business Intelligence
- A Mobile Cloud-based Big Data Framework to Connect Patients with the Doctors

PROJECT

Importance of
Medical + Computing Joint Research

January 2013 – Approached Dr. Asad Toonsi to help us in Medical Collaboration

- Visited Disabled Children Hospital, Makkah

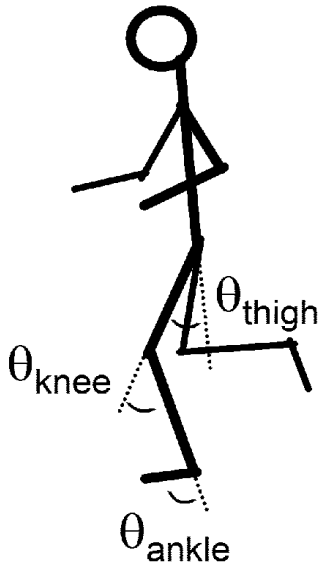
- Our PhD students started learning about advances in therapy world

- Visited Al Noor Hospital, Basma Center…

- A hand from medical domain made all this incredible journey of computing possible

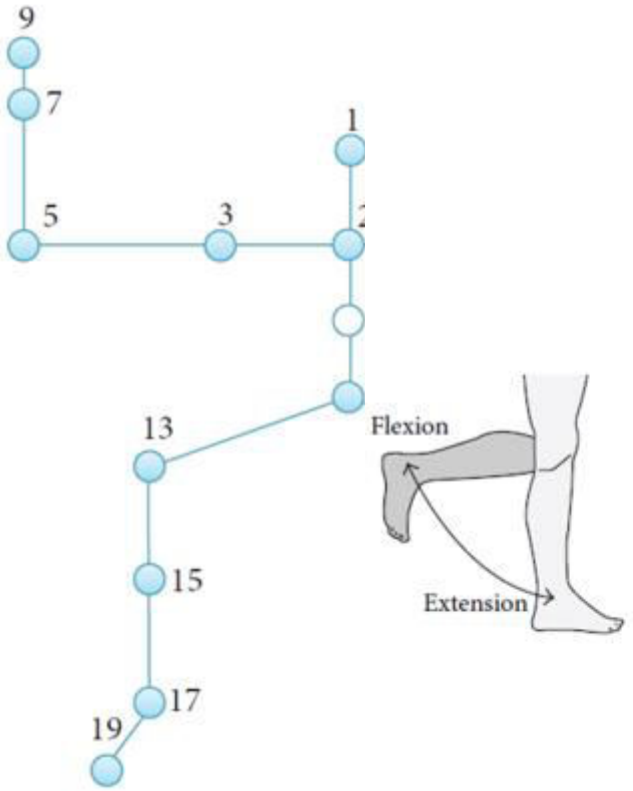
Core Finding

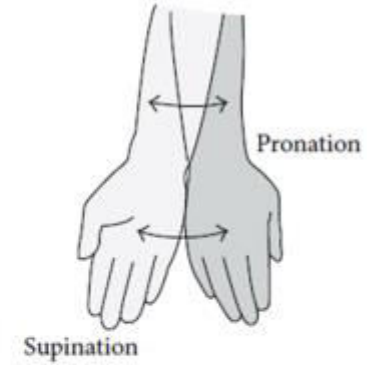
- Human body dynamics
  - Kinematics – motions (running, moving hand…), both linear and rotational
  - Kinetics – cause of motion (force, energy…)
  - Forward and Inverse Kinematics

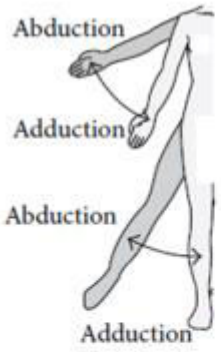


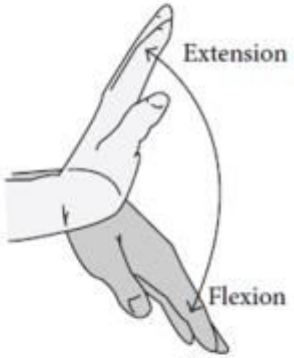
- DoF and Primitive Joint-Motions
  - Can we detect every joint-motion of a human body in real-time?
  - Both Angular and rotational Kinematic Data

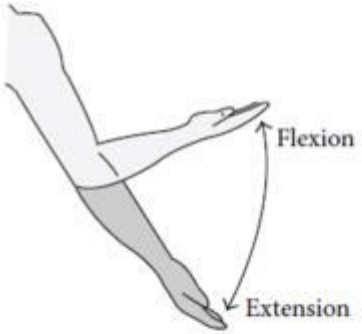
Core Finding (Primitive Joint-motion Analysis)

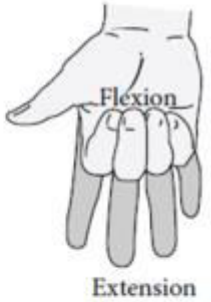


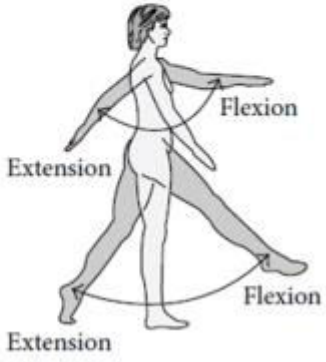


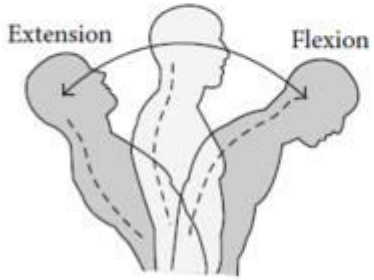






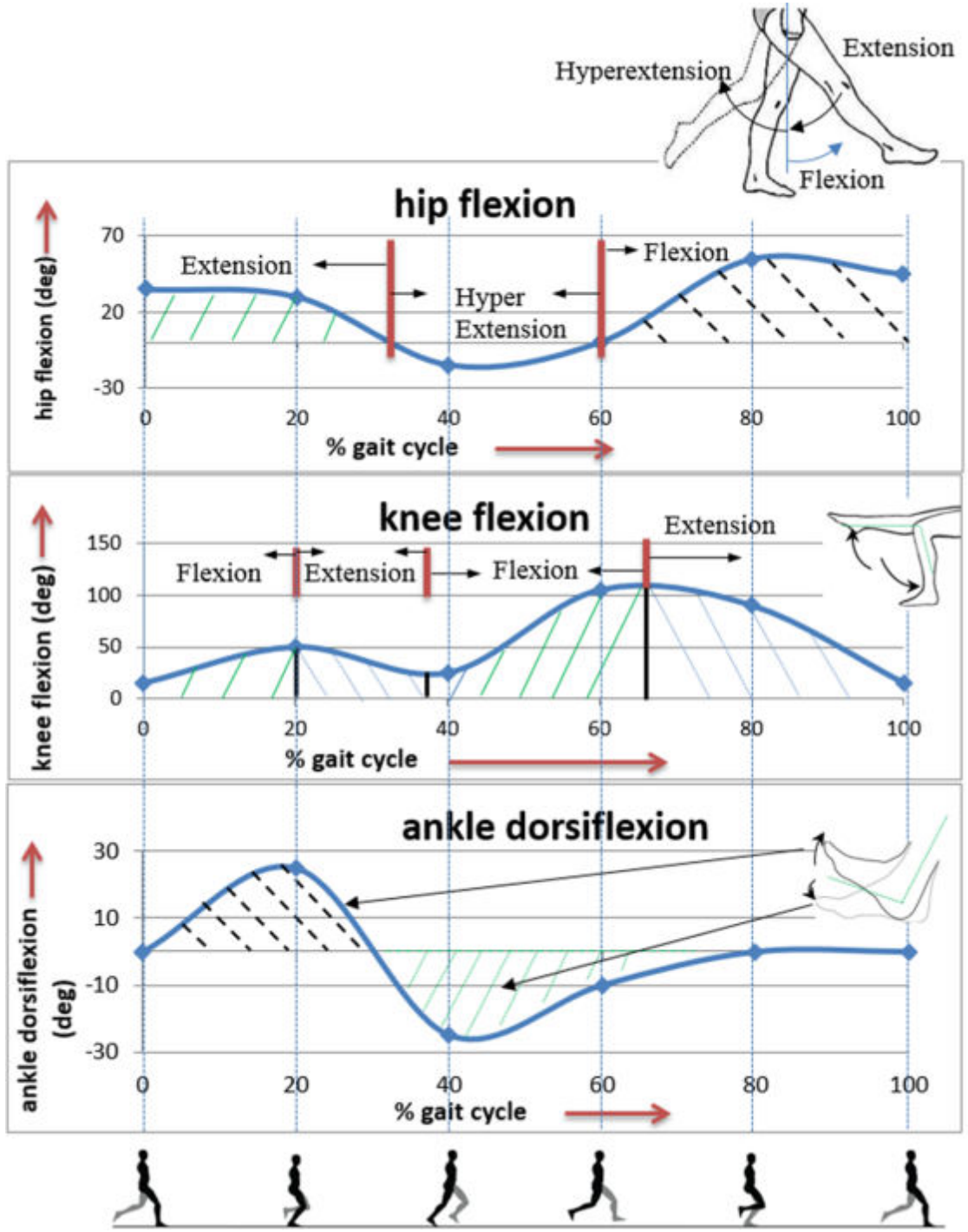




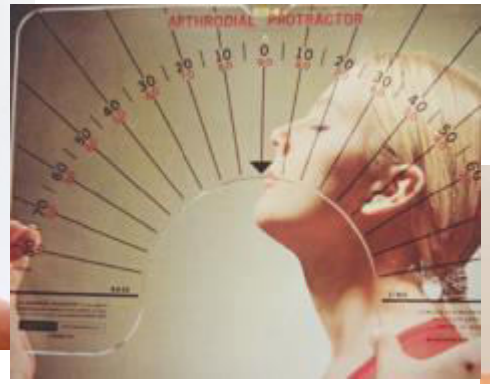


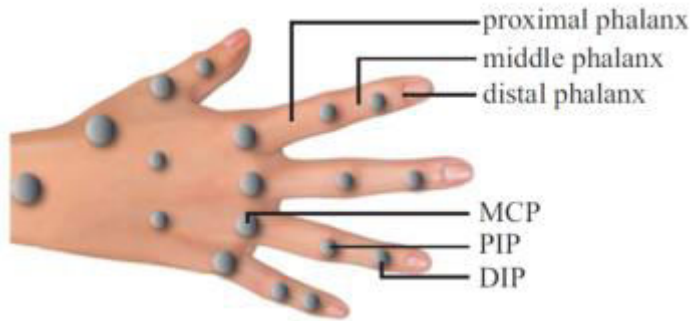
PROJECT

Core Finding (complex motion analysis such as walking, running…)



State of the Art





Non-invasive Multi-sensory Environment

Rotational and angular kinematic data of all the hand joints

EMG signal to interpret hand gestures

Rotational and angular kinematic data of the whole body joints