

Curriculum Vitae

Ana de los Reyes Guzmán

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PROFILE

1. Main Research Interests and Current Projects

I'm engineer at the Biomechanics and Technical Aids Department (Hospital Nacional de Paraplégicos, Toledo, Spain) since 2007. I reached the degree of PhD in Biomedical Engineering at Universidad Politécnica de Madrid in 2015. My main research field at the Biomechanical and Technical Aids Department is focused on the rehabilitation of movement disorders. My early work was related to the development of a biomechanical model of the human trunk and arm. This model was applied to the measurement of upper limb movements during reach and grasp functional tasks, and activities of daily living (ADLs). Moreover, I has started the signal processing of surface EMG in the unit with a new study regarding the muscle synergies extraction with the aim of examining the differences in the number and structure of muscle synergies between healthy and people with cervical spinal cord injury. The same study is being performed in gait analysis. The following step was the development of objective metrics related to ability and dexterity for the functional evaluation of the upper limb. This work was a further research in relation to the upper limb movement analysis during reaching movements and ADLs and was implemented in the doctoral thesis. Nowadays, the work is centered in involving low-cost technology in the rehabilitation process after Spinal Cord injury. The most recent project is related to the development of virtual reality applications based on Leap Motion Controller for upper limb rehabilitation. Each application has been designed with a rehabilitative purpose, involving the execution of movements and hand gestures, which should be rehabilitated in patients. Actually, I'm the responsible person for conducting the clinical trial by using Armeo Spring device as rehabilitation treatment in Spinal Cord injured patients. Actually, I belong to the Agencia Estatal de Investigación for the assessment of new research proposals.

2. Academic Degrees

- PhD. in Biomedical Engineering at the Universidad Politécnica de Madrid (2015).
- Master's in Telemedicine and Biomedical Engineering at the Universidad Politécnica de Madrid (2009).
- Certificate of professional teaching aptitude, Universidad de Alcalá de Henares (2007).
- Higher Technical Telecommunication Engineer at the Universidad Politécnica de Madrid (2006).

3. Current Position

- Engineer at the Biomechanics and Technical Aids Department, Hospital Nacional de Paraplégicos, Toledo, Spain. (Junio 2007 - Present).

4. Publications

Scientific journal

- Alvarez-Rodríguez, M., López-Dolado, E., Salas-Monedero, M., Lozano-Berrio, V., Ceruelo-Abajo, S., Gil-Agudo, A., de los Reyes-Guzmán, A. (2020) Concurrent Validity of a Virtual Version of Box and Block Test for Patients with Neurological Disorders. *World Journal of Neuroscience*, 10, 79-89. <https://doi.org/10.4236/wjns.2020.101009>
- Alvaro Gutiérrez; Delia Sepúlveda Muñoz; Angel Gil Agudo; Ana de los Reyes Guzmán. Serious Game Platform with Haptic Feedback and EMG monitoring for Upper Limb Rehabilitation and Smoothness Quantification on Spinal Cord Injury Patients *Applied Sciences*. Applied sciences. 10 - 963, MDPI, 24/01/2020. ISSN 2076-3417. DOI: <https://doi.org/10.3390/app10030963>
- Ana de los Reyes Guzmán; Elisa López Dolado; Félix Monasterio-Huelin; Angel Gil Agudo. Methodological Refinement of Upper Limb Kinematics of Spinal Cord Injured Patients Through Principal Component Analyses. *Biomedical Journal of Scientific and Technical Research*. 23 - 4, pp. 17634 - 17639. 09/12/2019.
- Miriam Salas Monedero; Nuria Mendoza Laíz; Vicente Lozano Berrio; María Alvarez Rodríguez; Silvia Ceruelo Abajo; Angel Gil Agudo; Ana de los Reyes Guzmán. Análisis de viabilidad del uso de la tecnología de bajo coste en el entrenamiento de miembros superiores en personas con lesión medular cervical. *Arch Med Deporte*. 35 - 1, 01/12/2018. ISSN 0212-8799

- Elisa López Dolado; Vicente Lozano Berrio; Angel Gil Agudo; Ana de los Reyes Guzmán. Motor Control Aspects related to upper limb movement in Spinal Cord Injured patients. *Journal of Neurotrauma*, 2018, 35 - 16, pp. A173 - A173. ISSN 0897-7151.
DOI: <https://doi.org/10.1089/neu.2018.29013.abstracts>

- Daniel Alvarez Sanchez-Bayuela; Francisco Javier Espino Rodríguez; Ana de los Reyes Guzmán; Vicente Lozano Berrio; Angel Gil Agudo; Antonio del Ama Espinosa. Simulación del efecto de la transferencia nerviosa desde músculo trapecio a bíceps sobre la estabilidad del hombro mediante OpenSIM. *Cognitive Area Networks*. 5 - 1, pp. 105 - 110. Asociación Nicolo, 01/06/2018.

- Ana de los Reyes Guzmán; Vicente Lozano Berrio; Miriam Salas Monedero; Angel Gil Agudo. VALIDACIÓN DEL DISPOSITIVO LEAP MOTION PARA SU APLICACIÓN EN PACIENTES CON TETRAPLEJIA. *Cognitive Area Networks*. 25, 23/06/2017. ISSN 2341-4243

- Diego Torricelli; Ana de los Reyes Guzmán; Elisa López Dolado; Vicente Lozano Berrio; Soraya Pérez Nombela. Upper Limb Electromyographic Analysis Synchronized with Kinematics in Cervical Spinal Cord Injured Patients during the Activity of Daily Living of Drinking. *JSM Physical Med Rehabil*. 1 - 1, pp. 1004. 2017.

- Iris Dimbwadyo Terrer; Fernando Trincado Alonso; Ana de los Reyes Guzmán; Patricia López Monteagudo; Begoña Polonio López; Angel Gil Agudo. Activities of daily living assessment in spinal cord injury using the virtual reality system Toyra®: functional and kinematic correlations. *Virtual Reality*. 20 - 1, pp. 17 - 26. 2016. ISSN 1359-4338
DOI: <https://doi.org/10.1007/s10055-015-0276-2>

- Camilo Cortés; Ana de los Reyes Guzmán; Davide Scorza; Alvaro Bertelsen; Eduardo Carrasco; Angel Gil Agudo; Julián Flórez. Inverse kinematics for upper limb compound movement estimation in exoskeleton-assisted rehabilitation. *BioMed Research International*. 2016. Disponible en Internet en: <https://www.hindawi.com/journals/bmri/2016/2581924/>. DOI: <https://doi.org/10.1155/2016/2581924>

- Soraya Pérez Nombela; Filipe Barroso; Diego Torricelli; Ana de los Reyes Guzmán; Antonio del Ama Espinosa; Julio Gómez Soriano; Angel Gil Agudo. Modular control of gait after incomplete spinal cord injury: differences between sides. *Spinal Cord*. 2016. DOI:

<https://doi.org/10.1038/sc.2016.99>

- Ana de los Reyes Guzmán; Iris Dimbwadyo Terrer; Soraya Pérez Nombela; Félix Monasterio-Huelin; Diego Torricelli; José Luis Pons; Angel Gil Agudo. Novel kinematic indices for quantifying movement agility and smoothness after cervical Spinal Cord Injury. *Neurerehabilitation*. 38 - 2, pp. 199 - 209. 2016. DOI: <https://doi.org/10.3233/NRE-161311>
- Ana de los Reyes Guzmán; Iris Dimbwadyo Terrer; Soraya Pérez Nombela; Félix Monasterio-Huelin; Diego Torricelli; José Luis Pons; Angel Gil Agudo. Novel kinematic indices for quantifying upper limb ability and dexterity after cervical spinal cord injury. *Medical & Biological Engineering & Computing*. pp. 1 -12. 2016. Disponible en Internet en: <https://link.springer.com/article/10.1007%2Fs11517-016-1555-0>. DOI: <https://doi.org/10.1007/s11517-016-1555-0>
- Camilo Cortés; Luis Unzueta; Ana de los Reyes Guzmán; Oscar Ruiz; Julián Flórez. Optical Enhancement of Exoskeleton-Based Estimation of Glenohumeral Angles. *Applied Bionics and Biomechanics*. 2016. Disponible en Internet en: <https://www.hindawi.com/journals/abb/2016/5058171/>. DOI: <https://doi.org/10.1155/2016/5058171>
- Iris Dimbwadyo Terrer; Fernando Trincado Alonso; Ana de los Reyes Guzmán. Upper limb rehabilitation after Spinal Cord Injury: A treatment based on a Data-Glove and an Immersive Virtual Reality Environment. *Disability and Rehabilitation: Assistive Technology*. 11 - 6, pp. 462 - 467. 2016. DOI: <https://doi.org/10.3109/17483107.2015.1027293>
- Iris Dimbwadyo Terrer; Fernando Trincado Alonso; Ana de los Reyes Guzmán; MA Aznar; César Alcubilla; Antonio del Ama Espinosa; Begoña Polonio López; Angel Gil Agudo. Upper limb rehabilitation after Spinal Cord Injury: A treatment based on a Data-Glove and an Immersive Virtual Reality Environment. *Disability and Rehabilitation: Assistive Technology*. 11 - 6, pp. 462 - 467. 2016. DOI: <https://doi.org/10.3109/17483107.2015.1027293>
- Fernando Trincado Alonso; Iris dimbwadyo Terrer; Ana de los Reyes Guzmán; Patricia López Monteagudo; Alberto Bernal Sahún; Angel Gil Agudo. Kinematic Metrics Based on the Virtual Reality System Toyra as an Assessment of the Upper Limb Rehabilitation in People with Spinal Cord Injury. *BioMed Research International*. pp. 11. 2014.

- Ana de los Reyes Guzmán; Iris Dimbwadyo Terrer; Fernando Trincado Alonso; Félix Monasterio-Huelin; Diego Torricelli; Angel Gil Agudo. Quantitative assessment based on kinematic measures of functional impairments during upper extremity movements: A review. *Clinical Biomechanics*. 2014.
- Gil-Agudo A, de los Reyes-Guzmán A, Dimbwadyo-Terrer I, Peñasco-Martín B, Bernal-Sahún A, López-Monteaudo P, del Ama-espinoza A, Pons JL. A novel motion tracking system for evaluation of functional rehabilitation of the upper limbs. *Neural Regen Res*. 2013; 8(19): 1773-1782.

Book chapters

- María Alvarez Rodríguez; Esther Benayas Martín; Vicente Lozano Berrio; Silvia Ceruelo Abajo; Elisa López Dolado; Angel Gil Agudo; Francisco Talavera Díaz; Ana de los Reyes Guzmán. Estudio piloto de viabilidad acerca del uso de gafas de Realidad Virtual para la rehabilitación tras afecciones neurológicas. *Actas del XXXVII Congreso Anual de la Sociedad Española de Ingeniería Biomédica*. 29/11/2019. ISBN 978-84-09-16707-4
- Elisa López Dolado; Javier Espino; Mónica Alcobendas Maestro; Vicente Lozano Berrio; Angel Gil Agudo; Ana de los Reyes Guzmán. Evaluación biomecánica de la función residual del miembro superior tetraplégico tras cirugía de transposición tendinosa deltoidea posterior a tríceps braquial. Estudio de dos casos. *Actas del XXXVII Congreso Anual de la Sociedad Española de Ingeniería Biomédica*. pp. 87 - 90. 29/11/2019. ISBN 978-84-09-16707-4
- María Alvarez Rodríguez; Vicente Lozano Berrio; Silvia Ceruelo Abajo; Francisco Talavera Díaz; Angel Gil Agudo; Ana de los Reyes Guzmán. Virtualización del test clínico Box and Block basado en Leap Motion Controller. *Actas del XXXVII Congreso Anual de la Sociedad Española de Ingeniería Biomédica*. 29/11/2019. ISBN 978-84-09-16707-4
- Ana de los Reyes Guzmán; Elisa López Dolado; Enrique Pérez Rizo; Vicente Lozano Berrio; Angel Gil Agudo; Antonio J del Ama Espinosa. Análisis biomecánico para confirmar el diagnóstico en neurorrehabilitación. 11º Simposio CEA de Bioingeniería. 19/07/2019. ISBN 978-84-9048-793-8

DOI: <http://dx.doi.org/10.4995/CEABioIng.2019.10045>

- María Álvarez Rodríguez; Delia Sepúlveda Muñoz; Vicente Lozano Berrio; Silvia Ceruelo Abajo; Angel Gil Agudo; Alvaro Gutiérrez Martín; Ana de los Reyes Guzmán. Preliminary Development of two serious games for rehabilitation of Spinal Cord Injured Patients. *Converging Clinical and Engineering Research on Neurorehabilitation III*. pp. 375 - 379. Springer, 01/01/2019. Disponible en Internet en: <https://link.springer.com/chapter/10.1007/978-3-030-01845-0_75>. ISBN 978-3-030-01845-0 DOI: https://doi.org/10.1007/978-3-030-01845-0_75

- Ana de los Reyes Guzmán; Soraya Pérez Nombela; Iris Dimbwadyo Terrer; Diego Torricelli; Angel Gil Agudo. Functional Upper Limb Evaluation of Activities of Daily Living in People with Neurological disorders. Book: *Activities of Daily Living: Performance, Impact on Life Quality and Assistance*. pp. 55 - 76. Editores: Jean Baptiste Giroux and Charlotte Vallee. Nova Publishers, 2013. ISBN: 978-1-62417-957-0. Pp: 55-76. Status: Available. https://www.novapublishers.com/catalog/product_info.php?products_id=36983

- Dimbwadyo-Terrer I, De los Reyes-Guzmán A, Bernal-Sahún A, López-Monteagudo P, Trincado-Alonso F, Polonio-López B, Gil-Agudo A. Virtual Reality system Toyra: A new tool to assess and treatment for upper limb motor impairment in patients with Spinal Cord Injury. Pons JL et al (Eds): *Converging clinical and Engineering Research on Neurorehabilitation, BIOSYSROB 1*, Springer Berlin Heidelberg 2013 pp 1025-1029 DOI: [101007/978-3-642-34546-3_168](https://doi.org/10.1007/978-3-642-34546-3_168)

- Soraya Pérez Nombela; Antonio del Ama Espinosa; Ana de los Reyes Guzmán; Angel Gil Agudo; Francisco Molina Rueda; Diego Torricelli. The importance of gait analysis in Incomplete Spinal Cord Injury patients in field of neurorehabilitation. *Coverging Clinical and Engineering Research on Neurorehabilitation, BIOSYSROB 1*. pp. 673 - 677. Springer. Berlin Heidelberg, 2013.

- Ana de los Reyes Guzmán; Angel Gil Agudo. Análisis cinemático del miembro superior. *Neurorrehabilitación. Métodos específicos de valoración y tratamiento*. pp. 183 - 191. Editorial Panamericana, 2012.

- Angel Gil Agudo; Antonio del Ama Espinosa; Ana de los Reyes Guzmán; Alberto Bernal Sahún; Eduardo Rocón. Applications of Upper Limb Biomechanical Models in Spinal Cord Injury Patients. *Biomechanics in Applications*. InTech, 2011. DOI: 10.5772/1992

7. Recent research project

- "Plataforma de bajo coste para rehabilitación del miembro superior basado en realidad virtual", del Programa Estatal de I+D+i Orientada a los Retos de la Sociedad 2016 del Ministerio de Economía y Competitividad. Ref: DPI2016-77167-R. IP: Ana de los Reyes Guzmán. Duración: 30/12/16 a 29/12/2019. Financiación: 69000€.
- Proyecto de la convocatoria Explora Ciencia y tecnología el proyecto titulado "RECODE Rehabilitación motora de la lesión medular mediante aplicación combinada de exoesqueleto robótico, estimulación medular y modulación cortical", coordinado entre el Instituto Cajal-CSIC, la UCLM y la UBAT-SESCAM. Investigador Principal: Juan C. Moreno. Ana de los Reyes (investigador colaborador). Presupuesto solicitado: 130k€