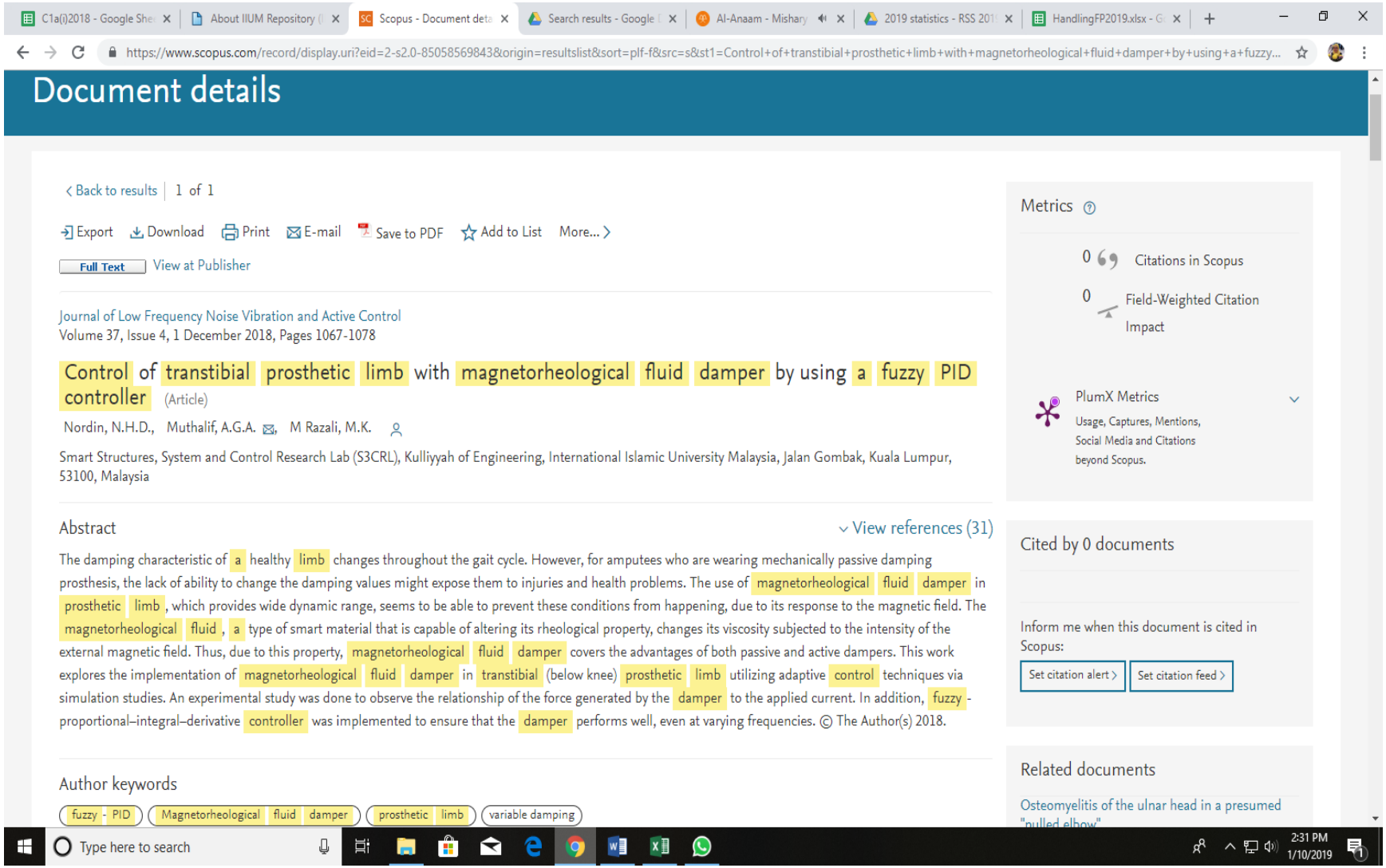
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Control of transtibial prosthetic limb with magnetorheological fluid damper by using a fuzzy PID controller (Article)
Nordin, N.H.D., Muthalif, A.G.A., M Razali, M.K.
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Abstract
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The damping characteristic of a healthy limb changes throughout the gait cycle. However, for amputees who are wearing mechanically passive damping prosthesis, the lack of ability to change the damping values might expose them to injuries and health problems. The use of magnetorheological fluid damper in prosthetic limb, which provides wide dynamic range, seems to be able to prevent these conditions from happening, due to its response to the magnetic field. The magnetorheological fluid, a type of smart material that is capable of altering its rheological property, changes its viscosity subjected to the intensity of the external magnetic field. Thus, due to this property, magnetorheological fluid damper covers the advantages of both passive and active dampers. This work explores the implementation of magnetorheological fluid damper in transtibial (below knee) prosthetic limb utilizing adaptive control techniques via simulation studies. An experimental study was done to observe the relationship of the force generated by the damper to the applied current. In addition, fuzzy - proportional–integral–derivative controller was implemented to ensure that the damper performs well, even at varying frequencies. © The Author(s) 2018.
Author keywords
fuzzy - PID
Magnetorheological fluid damper
prosthetic limb
variable damping
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