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To cite this version:
Charles Barnouin, Benjamin de Witte, Richard Moreau, Arnaud Lelevé, Xavier Martin. Cost-Efficient Laparoscopic Haptic Trainer Based on Affine Velocity Analysis. surgetica, Nov 2017, strasbourg, France. hal-04119542

HAL Id: hal-04119542
https://univ-catholille.hal.science/hal-04119542
Submitted on 13 Jun 2023

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HAL Id: hal-01563262
https://hal.science/hal-01563262
Submitted on 4 Feb 2019

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Learning minimal invasive surgery (MIS) skills is young surgeons’ major concern.

The use of materials enabling haptic feedback and developing a VR environment (Phantom Omni, CHAI3D, laparoscopic devices...) makes it possible to design a basic skill training simulator which objectively evaluate trainees’ level.

Affine velocity is a valid tool and another objective variable to evaluate trainees’ level.

Statistical test Kruskal and Wallis on affine velocity could help separate every groups but Experts and Novices only can be separated from Unexperience Interns.

A cognitive analysis of Affine velocity enables to design a reliable and valid simulator.

Affine velocity is a valid tool and another objective variable to evaluate a trainee skill on his trajectory.

Once a certain level of skill is reached, it becomes harder to differentiate individuals.

As feedback about skill level is displayed, the simulator should be effective in learning, this needs however to be confirmed by further investigations.

WHAT IS AFFINE VELOCITY

Relationship between geometry and kinematic, first shown in 2D drawing : 
\[ v = v_a K^{-1/3} \]

- With the curvature \( K \)

New power law for 3D movement :
\[ v = v_a K^{1/3} (1 + \beta \frac{\tau}{v_a}) \]

- With the torsion \( \tau \)
- \( \alpha \) and \( \beta \) are exponents that depend of the studied movement.

PCA with Expert and Intermediate fused with variables Collision, Time, and Affine Velocity

REFERENCES