



# LATIN NAO

Project for Fundamentals of Artificial Intelligence and  
Knowledge Representation

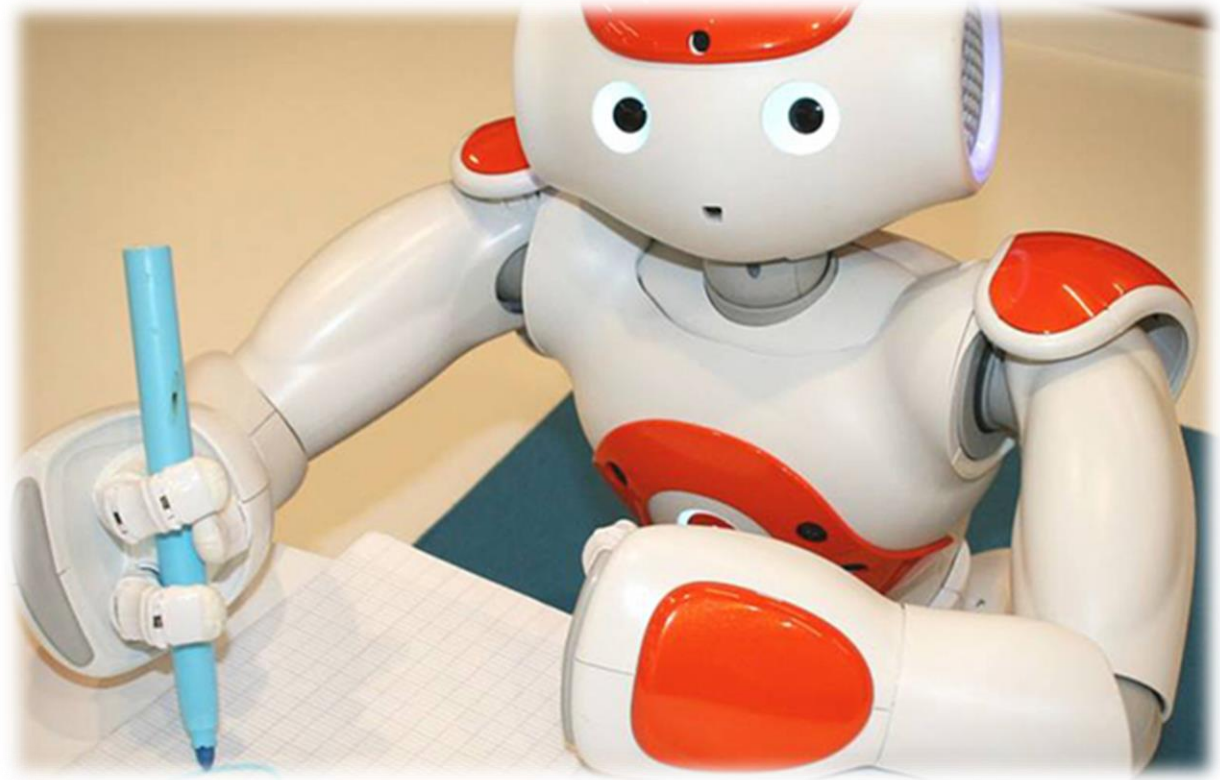


Can NAO perform a Latin dance?  
Let's see ...



- Song: Con Calma
- By: Daddy Yankee & Snow
- *Participants: Angely Oyola  
Marcello Sicbaldi*

# Agenda

- Literature Review
- Problems found
- Our Idea
- Future Work
- References



# Literature Review

- Dancing is paradigmatically a process of interaction [5]
- Here you can't win or lose. You can move in a free way [6]
-  Dancing robots require a sharp change in classical AI techniques.
- Dancing, unlike chess, has not a rigid structure and unambiguous end goals
-  Is NAO available to perform movements by itself in order to get a more human-like dance?  
Yes, but analyzing large sets of human motions, we can train a language model, then we can plan a sequence of wholebody pose transitions, which satisfies the constraints of a given locomotion task [1]

# Problems found

“ The problem of planning whole-body motions is a challenging problem due to the complexity of the kinematic chains, the dynamic constraints, and the multidimensionality of the tasks “ [1]

- Dancing is not a problem to be solved [5]
- Can't be deterministic in some cases[3]
- There's no way to do it “right” or criterion of success [6]
- For some human beings, it is hard to dance, so, poor NAO!!
- Limited movements, rigid joints, constraints to be satisfied
- There is no any goal to achieve

# Our Idea

- Detailed human planning
- Motions synchronized to the music.
- More human-like dance
- The choreography should reflect the emotional character of the music.

Then, how can we teach a robot how to dance? Split the problem into 2 independent subproblems



Decomposition of complex movements into simple and reusable motions



Integrating those motions to create a continuous final motion



# Future Work

- Analyze musical emotions and beat times automatically in order to choose the right motion. [3]
- With this idea we'll have emotion labels assigned to the motion primitives. [3]
- Create a dataset for training a neural network
- Nao could choose in a free way the movements to get a clear dance
- There won't be human intervention in the dancing



# References

- [1]: Mandery, C., Borras, J., Jöchner, M., & Asfour, T. (2016, October). Using language models to generate whole-body multi-contact motions. In *2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (pp. 5411-5418). IEEE.
- [2]: Latombe, J. C. (2012). *Robot motion planning* (Vol. 124). Springer Science & Business Media.
- [3]: Xia, G., Tay, J., Dannenberg, R., & Veloso, M. (2012, June). Autonomous robot dancing driven by beats and emotions of music. In *Proceedings of the 11th International Conference on Autonomous Agents and Multiagent Systems-Volume 1* (pp. 205-212). International Foundation for Autonomous Agents and Multiagent Systems.
- [4]: Jochum, E., & Derks, J. (2019, October). Tonight We Improvise!: Real-Time Tracking for Human-Robot Improvisational Dance. In *Proceedings of the 6th International Conference on Movement and Computing* (p. 7). ACM.
- [5]: Internet, <http://nautil.us/blog/the-limits-of-formal-learning-or-why-robots-cant-dance>, 2016
- [6]: Internet, <https://meaningness.com/metablog/robots-that-dance>