

THE PROBLEM ADRESSED

How to improve system performance with a real-time embedded optimization solver?

Many problems in automatic control, signal processing, real-time estimation, real-time resource allocation and decision making can be modeled as a Quadratically Constrained Quadratic Program (QCQP).

Due to changing conditions and/or new data arrivals, these problems need to be solved in real-time on a low cost hardware: **real-time embedded QCQP**.

Currently, no real-time embedded QCQP solver exists.

TECHNOLOGY

- The solver requires only simple mathematical operations: addition, subtraction, multiplication, division. No matrix inversion is necessary.
- Does not require any external libraries.
- Can be embedded in a low-cost microcontroller.
- 1000x faster than the state of the art primal-dual interior point method.

COMPETITIVE ADVANTAGES

- Provides an alternative solution to artificial intelligence (AI) based technology.
- Our solution is based on physics. We understand why and how it works.
- No permanent internet connection needed to run, nor permanent maintenance operations.
- As it can run on low-cost hardware, it is cheaper, than that of AI based solutions.

APPLICATIONS

- Robotics & drones
- Autonomous vehicle.
- Energy management.

DEVELOPMENT STATUS

- The QCQP solver has been validated experimentally for the energy management problem of smartgrid.
- A real time optimization lab is currently built.
- A QCQP Matlab/Python toolbox is currently constructed.
- TRL~4

INTELLECTUAL PROPERTY

- Various Software and data-base, under private license

INVENTORS & CONTACTS

- Hoai Nam NGUYEN, associate professor with 7 years industrial experience.
hoai-nam.nguyen@telecom-sudparis.eu
- TTO: paul_roland@telecom-sudparis.eu

PUBLICATIONS

- Hoai Nam Nguyen, *Optimal Self-Adaptive Parameter Selection for ADMM: Quadratically Constrained Quadratic Program*, IEEE TAC, 2023.
- Vahid Hamdipoor, Hoai Nam Nguyen, Bouchra Mekhaldi, Johan Parra, Jordi Badosa, *Experimental validation of scenario-based stochastic model predictive control of nanogrids*, CEP, 2024
<https://nguyenhoainam.wp.imt.fr/publications/>

LOOKING FOR

- Expanding to new use cases.
- Co-development partners, active CEO.
- Services customers.