

# Journal

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### Monday (week 5) 29-01-2024

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#### Kristoffer

- At Beumer
- Started project
- Had meeting with Jonas discussing what to start with the first 2 weeks
- Read these papers:
  - A visual introduction to Gaussian Belief Propagation [1]
  - Distributing Collaborative Multi-Robot Planning With Gaussian Belief Propagation [2]
- Tried compiling examples from <https://github.com/aalpatya/gbpplanner> but faced issues with missing X11 headers, even though they were installed on my system.

### Tuesday (week 5) 30-01-2024

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#### Kristoffer

- Worked from home.
- Created GitHub repository <https://github.com/AU-Master-Thesis/gbp-rs> as we want to rewrite the <https://github.com/aalpatya/gbpplanner> in Rust.
- Looked at different Rust simulation/visualization tools to use.
  - <https://macroquad.rs/>
  - <https://nannou.cc/>
  - <https://bevyengine.org/>
- Decided to go with **bevy** as it has a lot of community support/solutions and we thought its ECS system is really cool!.
- We read through the introduction book for bevy, to learn the core concepts behind the ECS paradigm and how applications are structured in bevy.

### Wednesday (week 5) 31-01-2024

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#### Kristoffer

- At OrbitLab

- Continued to have issues compiling the code for <https://github.com/aalpatya/gbpplanner>.
- We both decided to re-flash our OS with NixOS.
- Spent some getting acquainted with the terminology and methodology of how to do things in NixOS
- Create a `flake.nix` for both our Rust port and gbpplanner to create a reproducible environment, where we can compile and run the code without issue.

## Thursday (week 5) 01-02-2024

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### Kristoffer

- At OrbitLab
- Continued learning about NixOS and setting up our development environment, with the tools we like to use.
- Spent some time trying to port the code from [https://colab.research.google.com/drive/1-nrE95X4UC9FBLR0-cTnsIP\\_XhA\\_PZKW?usp=sharing#scrollTo=NzotHENoaY6g](https://colab.research.google.com/drive/1-nrE95X4UC9FBLR0-cTnsIP_XhA_PZKW?usp=sharing#scrollTo=NzotHENoaY6g) to our Rust implementation.

## Friday (week 5) 02-02-2024

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### Kristoffer

- Worked from home.
- Continued our attempt to port the code from [https://colab.research.google.com/drive/1-nrE95X4UC9FBLR0-cTnsIP\\_XhA\\_PZKW?usp=sharing#scrollTo=NzotHENoaY6g](https://colab.research.google.com/drive/1-nrE95X4UC9FBLR0-cTnsIP_XhA_PZKW?usp=sharing#scrollTo=NzotHENoaY6g) to our Rust codebase.
- Jens wrote the code, while we both discussed how to port the Python code to Rust.

## Monday (week 6) 05-02-2024

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### Kristoffer

- At Beumer
- Read recent survey paper from 2023 [3].
  - No mention of any paper/approach using Gaussian Belief Propagation.
  - Many newer paper use AI methodologies.
    - Neural Network based
    - Genetic Algorithms
      - Ant Colony
      - artificial bee colony algorithm
  - Lin–Kernighan–Helsgaun heuristic algorithm (dunno, names sounds interesting )
  - Dynamic Particle Swarm Optimization (PSO) [ref: 126,128]

## Bibliography

- [1] J. Ortiz, T. Evans, and A. J. Davison, “A visual introduction to Gaussian Belief Propagation”, *arXiv preprint arXiv:2107.02308*, 2021.

- [2] A. Patwardhan, R. Murai, and A. J. Davison, “Distributing Collaborative Multi-Robot Planning With Gaussian Belief Propagation”, *IEEE Robotics and Automation Letters*, vol. 8, no. 2, pp. 552–559, 2023, doi: [10.1109/LRA.2022.3227858](https://doi.org/10.1109/LRA.2022.3227858).
- [3] N. Abujabal, R. Fareh, S. Sinan, M. Baziyad, and M. Bettayeb, “A comprehensive review of the latest path planning developments for multi-robot formation systems”, *Robotica*, vol. 41, pp. 1–26, 2023, doi: [10.1017/S0263574723000322](https://doi.org/10.1017/S0263574723000322).