GSoC 2019 Report Divyanshu Thakur: Group Theory

This page summarises the work that I have done during the GSoC period along with the links to PR's submitted in chronological order. See my blog for weekly progress of the project.

About Me

My name is Divyanshu Thakur and I have completed my third year of Bachelor's in Computer Science from Indian Institute of Information Technology Manipur.

Pull Requests

1. Abelian Invariants: Implementation of Abelian Invariants algorithm for both Permutation and Finitely Presented groups.

2. Composition Series: Computation of Composition Series for solvable groups.

3. Polycyclic Groups: Providing SymPy with the capability to compute with polycyclic groups. Two classes namely `PolycyclicGroup` and base class `Collector` has been implemented. Polycyclic presentation has been also implemented, In addition few other methods to compute with polycyclic single generator were also implemented.

4. Induced Pcgs and Exponent vector: Added capability to compute with polycyclic subgroups.

5. Documenting Polycyclic Groups: Added documentation for polycylic groups. The sequence in which polycyclic presentation is computed is also explained in detail. Examples were provided for every functionality.

6. Extended Polycyclic Group docstrings: Other additional missing sections were introduced in the docstrings of `pc_groups.py` like `Parameters`, `Returns` and `See Also`.

Future Work

A lot of things have been covered during the GSoC period, things that remain will be continued by me post GSoC and I hope this report will be useful for anyone wishes to contribute to the `Group Theory` module in future. Following is a list that comprises of all the ideas which can extend my GSoC project.

- Extending the functionalities of polycyclic groups, Implementing Canonical polycyclic sequence to check if two polycyclic subgroups are equal.
- Implementing Polycyclic orbit stabilizer.
- Implementing Hall Subgroups.

Due to the extended work on polycyclic groups, few of the things proposed in my proposal were remain un-implemented. Here is a list for further reference.

- Implementation of Quotient groups.
- Automorphisms.

Conclusion

This summer has been a great learning experience. I plan to actively contribute to SymPy, specifically to this project. I am grateful to my mentor, Kalevi for reviewing my work, giving me valuable suggestions, and being readily available for discussions.