Chapter 1

Search Engines and Search Strings

1.1 IEEE Xplore

Search strings used:

- String 1:
  - (train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization") AND (bee colony optimization OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization") AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai) AND ("multi agent") AND ("graph database" OR neo4j)

  Number of results: 0

  Date of search: 29.10.2014

- String 2 (without neo4j and graph database, including multi angent):
  - (train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization") AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization") AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai) AND ("multi agent")

  Number of results: 56

  Date of search: 29.10.2014

- String 3 (removed the different vehicle terms and multi agent):

– (“path optimization” OR “scheduling optimization” OR “route optimization”) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization”) AND (transit OR transportation OR traffic OR vehicle) AND (“artificial intelligence” OR ai)

Number of results: 166

Date of search: 29.10.2014

- String 4 (added abbreviations of the algorithms):

  – (“path optimization” OR “scheduling optimization” OR “route optimization”) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR aso OR bso) AND (transit OR transportation OR traffic OR vehicle) AND (“artificial intelligence” OR ai)

  Number of results: 178

  Date of search: 29.10.2014

- String 5 (swithched the first AND with an OR):

  – ((“path optimization” OR “scheduling optimization” OR “route optimization”) OR (transit OR transportation OR traffic OR vehicle)) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aso) AND (”artificial intelligence” OR ai)

  Number of results: 4300

  Date of search: 29.10.2014

- String 6 (switched the OR back to AND. Removed artificial intelligence and ai):

  – (“path optimization” OR “scheduling optimization” OR “route optimization”) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco)

  Number of results: 687

  Date of search: 29.10.2014

- String 7 (good number of results, but we want to inlude transportation, vechicle, train, plane, bus and delivery because it is an important part of what we are looking for):

  – (“path optimization” OR “scheduling optimization” OR “route optimization”) AND (transit OR traffic OR transportation OR vehicle OR train OR

plane OR bus OR delivery) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR pso OR bso OR aco)

Number of results: 508

Date of search: 29.10.2014

1.2 ACM digital library

Search strings used:

- String 1 (the same string that gave the best result in IEEE Xplore):
  - ("path optimization" OR "scheduling optimization" OR "route optimization") AND (transit OR traffic OR transportation OR vehicle OR train OR plane OR bus OR delivery) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR pso OR bso OR aco)

  Number of results: 31

  Date of search: 29.10.2014

- String 2 (switched the first AND with an OR to get a more general result):
  - (("path optimization" OR "scheduling optimization" OR "route optimization" OR transit OR traffic OR transportation OR vehicle OR train OR plane OR bus OR delivery) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR pso OR bso OR aco))

  Number of results: 1,294

  Date of search: 29.10.2014

- String 3 (removed some less relevant word, such as schduling optimization, transit and plane):
  - (("path optimization" OR "route optimization" OR transportation OR vehicle OR bus) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR pso OR bso OR aco))

  Number of results: 622

  Date of search: 29.10.2014

- String 4 (in addition a search was done were we added the terms "neo4j" and "graph database" for the search string that originial gave the most results. Non of the found papers were relevant):

– ((“path optimization” OR “scheduling optimization” OR “route optimization” OR transit OR traffic OR transportation OR vehicle OR train OR plane OR bus OR delivery) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco) AND (neo4j OR “graph database”))

Number of results: 4

Date of search: 29.10.2014

1.3 ScienceDirect

Only searched in publications in the subject of computer science. Papers published between 1970 and now.

Search strings used:

- String 1
  - (“path optimization” OR “scheduling optimization” OR “route optimization”) AND (transit OR traffic OR transportation OR vehicle OR train OR plane OR bus OR delivery) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR colony OR pso OR bso OR aco)

  Number of results: 126

  Date of search: 29.10.2014

- String 2 (Not enough results. Made it more general by removing AND’s and adding OR’s)
  - ((“path optimization” OR “route optimization” OR transportation OR vehicle OR bus) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco))

  Number of results: 2971

  Date of search: 29.10.2014

- String 3 (Too general. Added “artificial intelligence” and AI)
  - ((“path optimization” OR “route optimization” OR transportation OR vehicle OR bus) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco)) AND (“artificial intelligence” OR ai)

Number of results: 1459

Date of search: 29.10.2014

- String 4 (Still too general. Added “routing”)
  - ((“path optimization” OR “route optimization” OR transportation OR vehicle OR bus) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco)) AND (“artificial intelligence” OR ai) AND routing

  Number of results: 535

  Date of search: 29.10.2014

- With neo4J (Searched for neo4J and “graph database” with the query that gave the most results.)
  - ((“path optimization” OR “route optimization” OR transportation OR vehicle OR bus) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco) AND (neo4j OR “graph database”)

  Number of results: 4 - Non of the results are relevant or indicates that our idea has been done before.

  Date of search: 29.10.2014

1.4 CiteSeer

Search strings used:

- String 1 (Used the query with the most results from the previous search engine.)
  - text:(((“path optimization” OR “route optimization” OR transportation OR vehicle OR bus) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco)))

  Number of results: 4533

  Date of search: 30.10.2014

- String 2 (This query gave too many results, added (“artificial intelligence” OR “ai”) AND “routing”)
  - text:(((“path optimization” OR “route optimization” OR transportation OR vehicle OR bus) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco)) AND (”artificial intelligence” OR ai) AND routing)

Number of results: 327

Date of search: 30.10.2014

- With neo4J
  - text:(((“path optimization” OR “route optimization” OR transportation OR vehicle OR bus) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR pso OR bso OR aco) AND (neo4j OR “graph database”))

Number of results: 4 - Non of the results are relevant or indicates that our idea has been done before

Date of search: 30.10.2014

1.5 SpringerLink

Search strings used:

- String 1 (Used the best query from the previous search engine, and this gave a good result.)
  - (“path optimization” OR “scheduling optimization” OR “route optimization”) AND (transit OR traffic OR transportation OR vehicle OR train OR plane OR bus OR delivery) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR colony OR pso OR bso OR aco)

Number of results: 403

Date of search: 03.11.2014

- With neo4J
  - (“path optimization” OR “scheduling optimization” OR “route optimization”) AND (transit OR traffic OR transportation OR vehicle OR train OR plane OR bus OR delivery) AND (“bee colony optimization” OR “particle swarm optimization” OR “swarm intelligence” OR “ant colony optimization” OR colony OR pso OR bso OR aco) AND (neo4j OR “graph database”)

Number of results: 0

Date of search: 03.11.2014

1.6 Google Scholar

Google scholar does not accept long queries. The result is all the queries/results combined. **Search strings used:**

- String 1 (with "bee colony optimization")
  - ("path optimization" OR "route optimization") AND (transportation OR bus OR vehicle) AND ("artificial intelligence" OR ai) AND routing AND ("bee colony optimization" OR bco)

  Number of results: 13

  Date of search: 03.11.2014

- String 1 (with "neo4J" and "graph database")
  - ("path optimization" OR "route optimization") AND (transportation OR bus OR vehicle) AND ("artificial intelligence" OR ai) AND routing AND ("bee colony optimization" OR bco) AND (neo4j OR "graph database")

  Number of results: 0

  Date of search: 03.11.2014

- String 2 (with "particle swarm optimization")
  - ("path optimization" OR "route optimization") AND (transportation OR bus OR vehicle) AND ("artificial intelligence" OR ai) AND routing AND ("particle swarm optimization" or pso)

  Number of results: 131

  Date of search: 03.11.2014

- String 2 (with "neo4J" and "graph database")
  - ("path optimization" OR "route optimization") AND (transportation OR bus OR vehicle) AND ("artificial intelligence" OR ai) AND routing AND ("particle swarm optimization" or pso) AND (neo4j OR "graph database")

  Number of results: 0

  Date of search: 03.11.2014

- String 3 (with "swarm intelligence")
  - ("path optimization" OR "route optimization") AND (transportation OR bus OR vehicle) AND ("artificial intelligence" OR ai) AND routing AND "swarm intelligence")

Number of results: 148

Date of search: 03.11.2014

String 3 (with “neo4J” and “graph database”)

- (“path optimization” OR “route optimization”) AND (transportation OR bus OR vehicle) AND (“artificial intelligence” OR ai) AND routing AND “swarm intelligence” AND (neo4j OR “graph database”)

Number of results: 0
Date of search: 03.11.2014

String 4 (with “ant colony optimization”)

- (“path optimization” OR “route optimization”) AND (transportation OR bus OR vehicle) AND (“artificial intelligence” OR ai) AND routing AND (“ant colony optimization” OR aco)

Number of results: 308
Date of search: 03.11.2014

String 4 (with “neo4J” and “graph database”)

- (“path optimization” OR “route optimization”) AND (transportation OR bus OR vehicle) AND (“artificial intelligence” OR ai) AND routing AND (“ant colony optimization” OR aco) AND (neo4j OR “graph database”)

Number of results: 0
Date of search: 03.11.2014

Chapter 2

Protocol

2.1 Search Terms

- Group 1: Train, plane, bus, delivery
- Group 2: Path optimization, Scheduling Optimization, Route Optimization, Planning
- Group 3: Bee colony optimization, Particle swarm optimization, Swarm intelligence, Ant colony optimization
- Group 4: Transit, Transportation, Traffic, Vehicle
- Group 5: Artificial Intelligence, ai
- Group 6: Multi-agent