ENERGY CONSUMPTION OF SEARCHING TREE ALGORITHMS IN REAL TIME APPLICATIONS

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Abstract: *It is important to make energy-aware decisions to improve the energy efficiency of computer systems. CPU power dissipation is the process in which CPUs consume electrical energy and dissipate it both by the action of the switching devices and by the energy lost in the form of heat due to the impedance of the electronic circuits. To overcome such loss of energy, there are many simple ways such as Power management, Green computing, etc. Power management is a way of ensuring computer systems are turned off when not required and in low power mode during idle periods. Green computer science is the study and practice of eco-friendly computing or IT. It can only work when manufactures, consumers and the regulatory agencies work together.*

1. INTRODUCTION

In this project, the energy consumption of different searching trees algorithms are measured using open source library jRAPL. The energy (power) consumed in watts was measured on searching tree algorithms.

Because of the widespread of internet, there are many applications such as GPS Navigation systems which use Google maps to give directions, landmarks, roads, etc., Facebook which treats each user profile as a node on the graph and 2 nodes are said to be connected if they each other's friends, Web Crawlers which is used to analyse what all sites we can reach by following links randomly on a particular website and many others use searching tree algorithms. But these algorithms vary because of their complexity. Selecting the right searching tree algorithms saves the energy consumption of the processing unit.

Searching Tree Algorithms used in this study:

The searching tree algorithms used in this project are: BFS (Breadth First Search), DFS (Depth First Search), Dijkstra's and Prim's.

BFS is an algorithm starts at the tree root and explores the neighbour nodes first, before moving to the next level neighbours. DFS is an algorithm starts at the tree root and explores as far as possible along each case before backtracking.

2. EXISTING SYSTEMS AND THEIR DRAWBACKS

Presently, the users using the real time applications based on the searching tree algorithms are unaware of the energy consumption. This project creates an awareness in using the appropriate searching tree algorithms that saves the energy consumption of the processing unit.

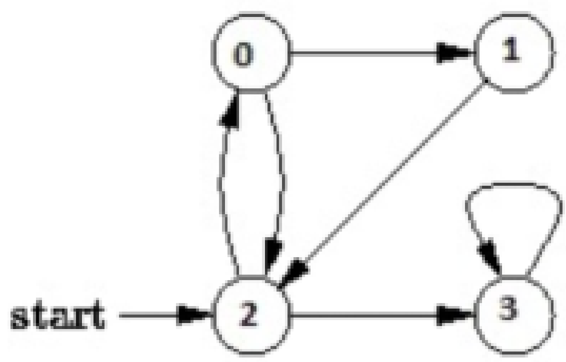
3. PROPOSED SYSTEM

In this project, searching tree algorithms used in various applications such as GPS Navigation systems, Facebook, Web Crawlers, etc. are analysed based on the Energy Consumption. The tool used in this project is jRAPL. It is a framework for profiling java programs running on CPUs with Running Average Power Limit (RAPL) support. RAPL is a set of low-level interfaces with the ability to monitor, control and get notification of energy and power consumption data of different hardware levels.

4. WORKING

Installing jRAPL is straight forward: one just needs to run the make command at the root directory. It needs super user permissions to access the Machine Specific Registers (MSR). Such MSRs can be accessed by OS, such as the msr kernel module in Linux. For any block of code in the application whose energy information is to the interest of the user, the programmer simply needs to enclose the code block with a pair of stat Check invocations.

Graphs used in searching tree algorithms may contain cycles, so we may come to the same node again. To avoid processing a node more than once, we use a Boolean visited array. For simplicity, it is assumed that all vertices are reachable from the starting vertex. For example, consider the graph with nodes 0, 1, 2 and 3. Let the source node be 2.



The screenshot of BFS and DFS for the above graph are shown in Figure a and Figure b respectively.

The power consumption of CPU in BFS is 0.1699 Watts and in DFS is 0.1396 Watts.

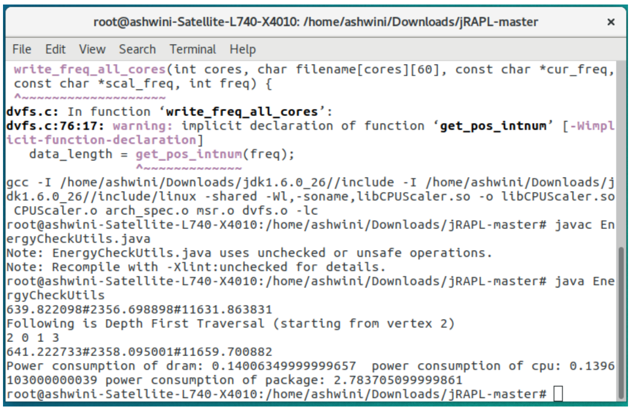


Figure a: screenshot of BFS

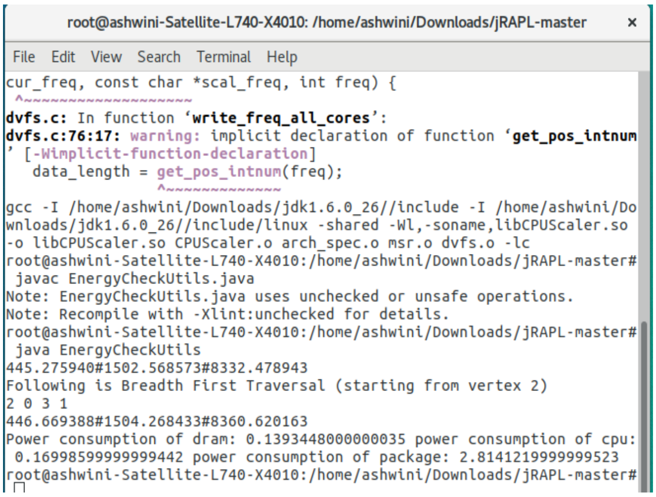


Figure b: screenshot of DFS

5. CONCLUSION

From the above figures a and b, the power consumption of DFS algorithm is very less when compared to BFS. For weighted graphs, the power consumption of Prim's algorithm is very less when compared to Dijkstra's. We further investigate which is better searching tree algorithm in terms of energy consumption in real time applications.

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