Seminar Report: seminar Opty

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1 Introduction

This seminar consists of a set of experiments of a Erlang server implementing a optimistic concurrency control, with backward validation, to access a database.

2 Work done

Some experiments have been designed to measure how different parameters affect the performance of the server.

Each experiment that shares the same source code is designed by a number. Each subexperiment where only the parameters are changed, belongs to the same experiment number, and is identified by a letter. This structure allows batch processing of all the experiments, and a change in the source code automatically produces an update on the subexperiments.

This hierarchy is controlled by Makefiles, which are programed to run all the experiments, produce the figures, and compile this document with the results in figures.

This design provides reproducible results. Some deviation may occur, as the seed was not fixed, and the concurrent process behavior is not predictable.

3 Experiments

In all the experiments the average of the success rate is plotted by a line, and also the standard deviation in the success rate of each client. For each measurement, there are some comments about the explanation of the system based on the observed behavior.

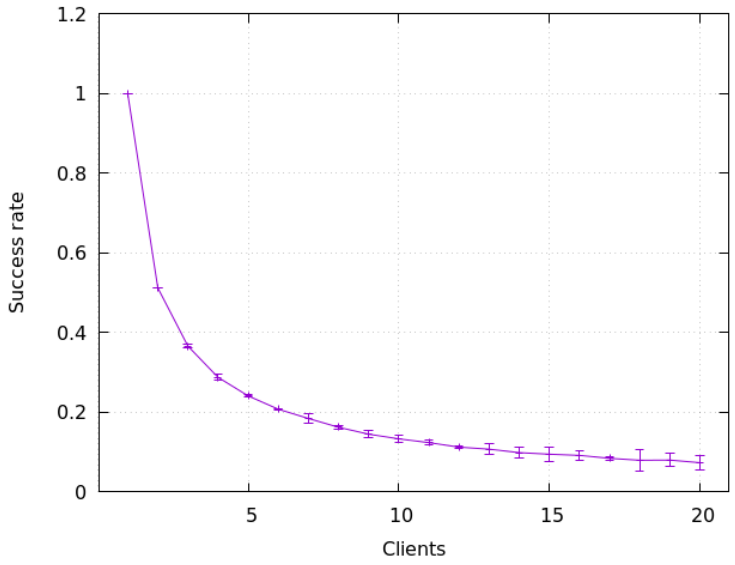
3.1 Experiment 1

Some set of experiments are performed to measure the performance of the transaction server. Each experiment is designed by a name like `exp1`α where α is a letter.

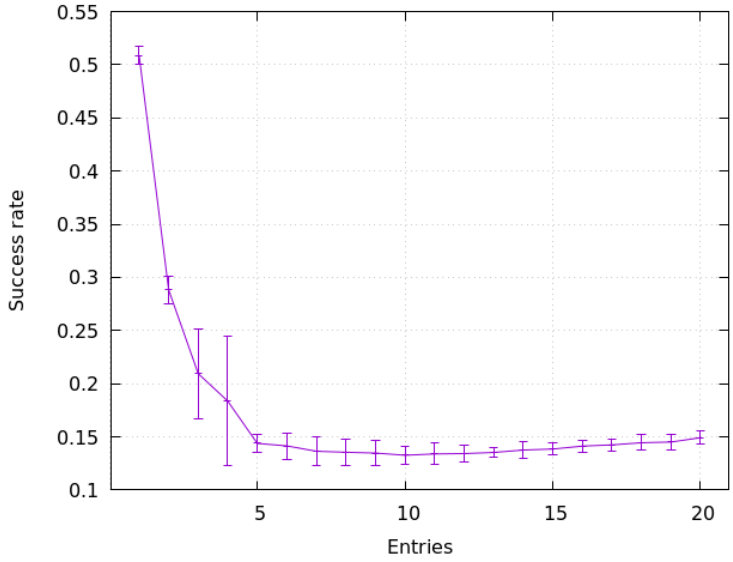
Exp.	Clients	Entries	Reads	Writes	Time (s)
`exp1a`	C	10	10	10	3
`exp1b`	10	E	10	10	3
`exp1c`	10	10	R	10	3
`exp1d`	10	10	10	W	3
`exp1e`	10	10	10	10	T
`exp1f`	10	10	i	$20 - i$	3

With $C, E, R, W \in [1, 20]$, $T \in [1, 10]$ and $i \in [0, 20]$.

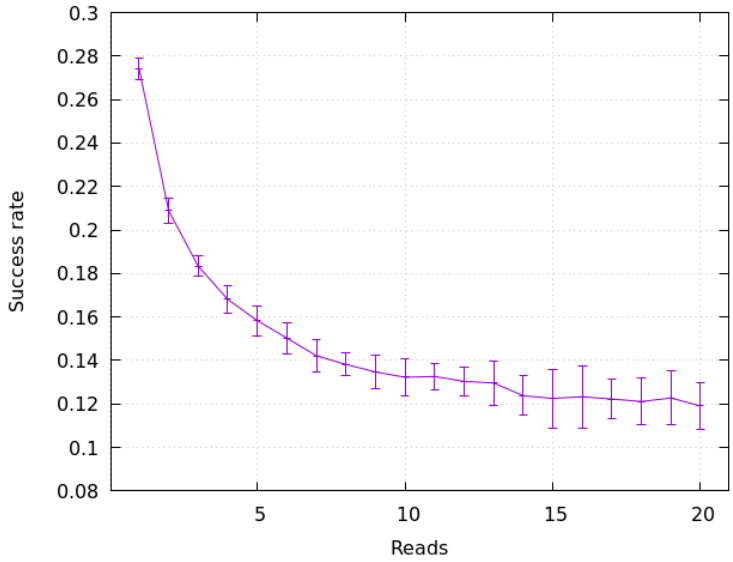
`exp1a`: Clients vs Success rate. As more clients try to access the database more transactions conflicts appear, so the average success rate decreases as they grow. Also, the success rate for each client is similar between clients.



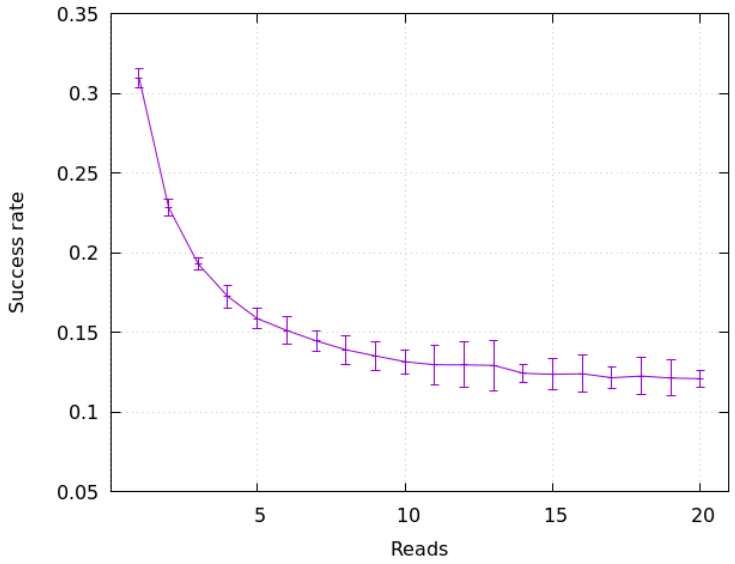
`exp1b`: **Entries vs Success rate** The average success rate decreases as the entries grow, until they reach the value 10. Then, the success rate starts to grow slowly. We observe a increasing deviation in the success rate with 3 and 4 entries. The other runs show small deviations.



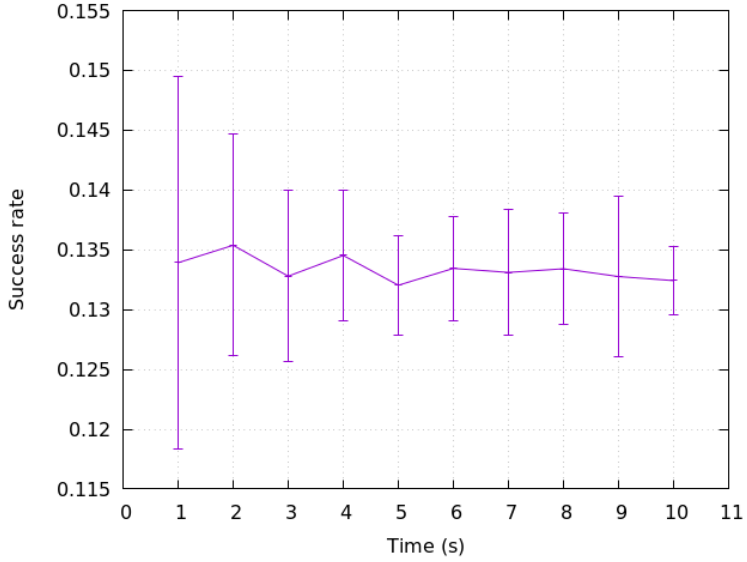
`exp1c`: **Reads vs Success rate** As the number of reads performed by the clients increases, more transactions are in conflict, so the success rate is reduced. The deviation increases as the number of reads increases.



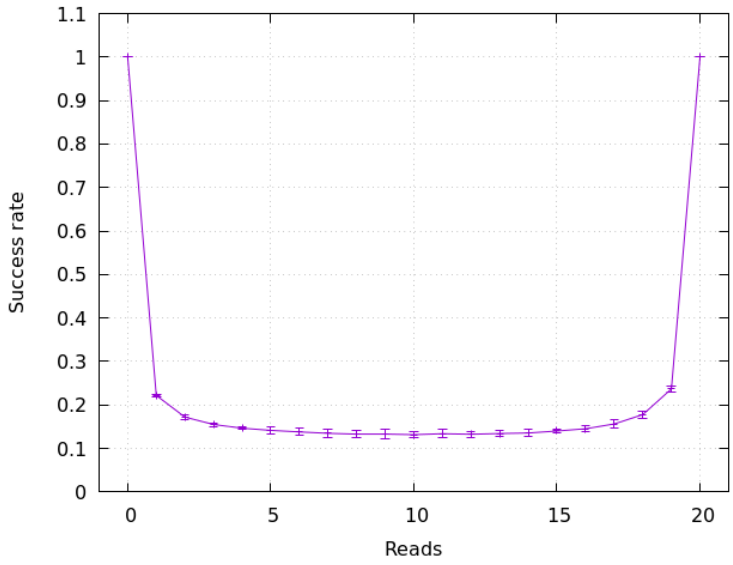
`exp1d`: **Writes vs Success rate** As the number of writes performed by the clients increases, more transactions are in conflict, so the success rate is reduced. The deviation increases with the number of writes.



`exp1e`: **Time vs Success rate** As the time allowed to the simulation grows, there seems that the success rate is not affected. The deviation seems to decrease as the time grows.



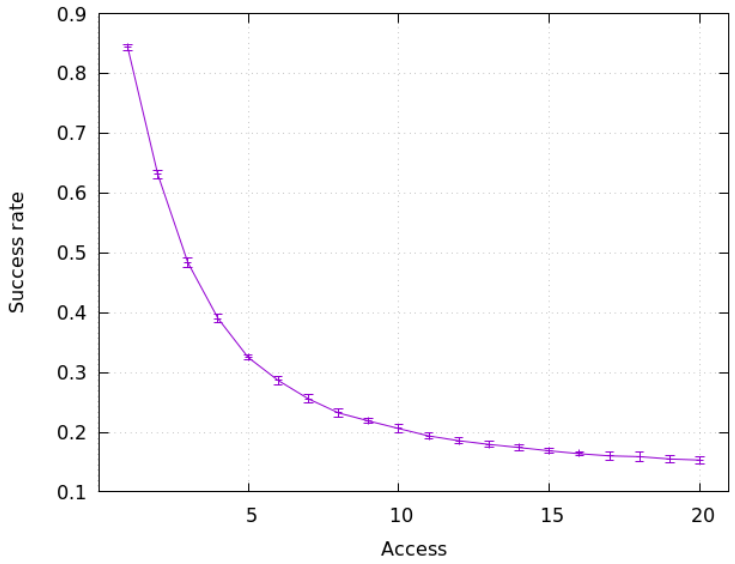
`exp1f`: **Ratio R/W vs Success rate** Let R be the number of reads, then the number of writes is defined as $W = 20 - R$. When the number of reads or writes is 0, we have no conflicts. But as the ratio is close to 1/2 the performance is worse. The deviation is small.



3.2 Experiment 2

The experiment `exp2a` modifies the behavior of the client in order to access only a random subset of the entries of the database. Each client maintains a subset of size A, which is randomly selected from all the entries. The size of the subset A is tested with values in $[1, 20]$ for a database of 20 elements.

`exp2a`: **Access subset size vs Success rate** There can be shown that the performance decreases as the access subset grows. The deviation between clients is small.



4 Personal opinion

Erlang is a bottleneck. I have spent about 90% of the time figuring out how to instruct the language to do what I wanted. Please look for a simpler alternative. Maybe Go is simple and stable enough. Or maybe you can provide a simple program with a graphical simulation to understand what happens.