Instituto Tecnológico de Costa Rica
Área Académica de Ingeniería en Computadores

Proyecto de Diseño en Ingeniería en Computadores

TEC | Tecnológico de Costa Rica

Progress report #5 for the project: Design of (ASIPs) for Approximate Computing

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1 Performed activities

1. **Implement the ASIPs in the error tolerant applications found (ID 03)**: The *absv* assembly instruction was implemented for the KNN algorithm. This allows computing the following operation in a single cycle:

$$rd = a > b?a - b : b - a \tag{1}$$

The operation described in (1) allows the execution of a subtract operation with an absolute result, which is used frequently in the KNN algorithm (the euclidean distance remains the main operation in this algorithm too).

2. **Implement two small assembly codes for each special instruction developed (ID 10)**: The first manually-written version of the assembly codes were implemented. These consists of a simple programs that loads each value of an array (lenght of 100, with all the values explicitly defined) and executes the corresponding operation(*eucl* or *absv*) with the actual special instruction or the equivalent with the common assembly instructions.

3. **Compare execution time, area and power vs error in selected applications (ID 09)**: Comparison at a simulation level was performed, with a lower total cycles found for the programs with the special instruction implemented (as expected). With the *eucl* instruction nearly a 10% of the total cycles reduction was achieved and almost 100% for the *absv* instruction.

2 Scope Changes

The total number of approximate applications has officially been changed from 3 to 2 and the scope of the approximations is reduced, eliminating the hardware-level approximation in the ASIPs. The following task was eliminated:

- **Write Test Plan document (ID 07)**: The tests will be performed as the supervisor Jorge Castro requests with a verbal agreement.

The following task was included:

- **Implement two small assembly codes for each special instruction developed (ID 10)**: Since the CoSy compiler did not work properly, a reduced manually-written assembly version of the algorithms K-Means and KNN is going to be implemented.

3 Earned Value analysis

In general, due to the difficulties explained in section 4, the project has a delay of approximately one week considering the new scope, despite having overestimated the cost of tasks (without the configurations problems), which in general have been done in less time than planned.

Table 1 summarizes the gained value analysis.

Table 1: Earned Value

Activity ID	Activity	Budget	%Planned Value	PV	AC	%Completed work	EV	CPI	SPI	Initial planned date	Ending date	Initial real date	Real ending
01	Get to know the software platform	32	100%	32	34	100%	32	0.94	1	Week 1	Week 3	Week 1	Week 7
02	Find appropiate error-tolerant Applications	32	100%	32	20	100%	32	1.6	1	Week 4	Week 6	Week 4	Week 10
03	Implement the ASIPs in the error tolerant applications found	64	100%	64	30	80%	51.2	1.71	0.8	Week 7	Week 12	Week 9	-
04	Write Project Plan Document	8	100%	8	10	100%	8	0,8	1	Week 1	Week 2	Week 1	Week 3
05	Write Requirements Document	8	100%	8	6	100%	8	1,33	1	Week 2	Week 3	Week 2	Week 4
06	Write Design Document	8	100%	8	7	100%	8	1.14	1	Week 3	Week 4	Week 3	Week 5
09	Compare execution time, area and power vs error in selected applications	32	25%	8	5	30%	9.6	1.92	1.2	Week 12	Week 16	Week 12	-
10	Implement two small assembly codes for each special instruction developed	16	66%	10.56	8	80%	12.8	1.6	1.21	Week 11	Week 13	Week 11	-
	Total			170.56	120		161.6	1.35	0.95				

4 Difficulties Encountered

- The server nodes which are the ones where the tools like ASIPMeister and Dlxsim work properly were disconnected for more than a week.

- The normal meeting on tuesday (01/05/2018) was cancelled due to the holiday, which delayed slightly more the progress on the project.

5 Hard Skills Required/Acquired

- Knowledge in the following software frameworks has been acquired: ASIPMeister and Dlxsim.

- Knowledge in HDL has been reinforced.

6 Soft Skills Required/Acquired

The following soft skills have been excercised:

- Self-Motivation: Given that there is no direct round-the-clock supervision, self-motivation has been key in working continously with the ASIPMeister and Dlxsim on the creation of special instructions for the approximate applications.

- Communication: Remote communication has been performed with Jorge Castro for the guidance of this project.

7 Lessons Learned

There are no lessons learned for the reported period.

References