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An examination of current algebraic tendencies for error elimation in countable works

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Abstract: Maths is used often in everyday life, even when people are not aware that they are doing it. Nearly every element of human life now makes use of mathematics. They use all areas of mathematics in addition to conventional applied mathematics. Recent years have witnessed a substantial advancement in mathematics-related activities such as research, applications, education, and presentation. Some of these advancements, such as the use of computers, are glaringly apparent and have a significant influence on how mathematics is taught. Programming, modelling, speculation, expository writing, and lectures are only a few of the many unique mathematical activities that are growing increasingly significant. Even while previous research underlines the necessity for high-quality algebra teaching, there is still a dearth of study on algebra problem-analysis for underachieving kids. This research recommends a problem-solving process to help children who are struggling in mathematics. The strategy takes into account recommendations from the maths and research policy boards. It is broken up into five primary sections, each of which focuses on an important component of algebra in the classroom. The study examines the relationship between the model's five abilities and a well-known algebraic measure as well as the validity of the metrics used to quantify the different skill sets. The results demonstrate a strong relationship between the model's five components and algebra competence as well as the model's high degree of accuracy in identifying students who are not proficient.

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I Introduction:

As would be the case in many other nations, algebra is often taught in India after arithmetic in the curriculum. The difficulties in making the above-described the transition from algebra to arithmetic and the impact on the learning of algebra has been studied in the course of research during the past several decades. According to several research, highlighting the relationship between arithmetic and algebra may lead to a lot of misunderstandings and is riddled with educational difficulties. Others, however, have emphasised the benefits of emphasising the relationship[1].

This is even though a number of research studies have investigated the connections between arithmetic as well as algebra, and pinpointed the root of several of the issues when it comes to the learning and teaching of algebra. These issues is discussed in the following paragraphs. With two types of tasks the study sought to develop an instructional strategy that algebra, and help students understand the meaning of symbols.: dealing with circumstances that give algebra a meaning and working with syntactic modifications26]. In the course of doing so, the research examined how students responded to the different activities in order to determine the kind of help needed to make the shift. This resulted in the teaching module's evolution and clarification of the methodology used to help students make the shift.

1.1.1 The arithmetic algebra connection:

Before examining arithmetic equations that are a series of binary operation, students had their first introduction to multi operations came in the course of computing simple binary operations at elementary school. In order to determine an individual value for every expression, even in the absence brackets it is essential to stick to the standards of the order of operations. This is the initial link between algebra and arithmetic since algebra provides general rules and guidelines to work with these mathematical expressions[3].

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These attributes govern the maintain their equivalence. Algebra gives the letter symbols to formally describe these features in broad terms. The rules for working with expressions are created in such a way that they encode the expressions' structure. Students often struggle to make the necessary transition to algebra because they are unable to perceive the relationship between arithmetic and algebra[4].

1.1.2 Hurdles in the transition to algebra:

The math curriculum has taught students to believe that a closed solution, or even a single number to be the answer and they mistakenly interpret terms such as 3+x and 3x as if they are comparable. For algebra, terms such as 3+x could mean diverse things. Therefore, it's essential to consider them objects and processes as well as ad-hoc "procepts." For example, the phrase 3+x could, which is the product of three, or any other number, or a greater amount than a number. Additionally, the symbols "+" and "-" can be read as meanings of subtraction or addition subtraction (the one that is most commonly used in math) and as signs that are affixed on a number to indicate the concept of change (increase or decrease) or conveying an idea of greater than or more or. In the same way the '=' symbol should be understood as a signifying equal or equivalent instead of its more popular definition of a computer command. Contrary to arithmetic where the meaning of a word and its denotation (value) is set and definite, in algebra it's important to discern between an expression's meaning that describes the relationship to which it is referring, and the denotation (value) and is able to change depending on situation[6-8]. One of the most crucial aspects in growing in algebraic awareness is the ability to be aware of different components in a flexible manner, focusing either one or the other, based upon the context.

By concentrating on how well they grasp arithmetic expressions and arithmetic calculations, students may better comprehend many of the challenges they encounter while handling algebraic expressions. Researchers have noted that pupils' ignorance of the structure of

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mathematical statements is the source of the issue. This prevents the pupils from being able to comprehend the characteristics of operations that can be reliably used in arithmetic settings and then generalised to deal with symbolic algebra. Students often make inconsistent decisions when assessing mathematical expressions and without calculation or 345-237+489 with 489+345-237. They sometimes properly solve the expressions 50-10+10+10 as 50-30 and 27-5+3 as 22+3, respectively. They would even be tempted to remove the '175's since they do not see any other method to compute the phrase 217+175-217+175+67. These mistakes result from an incorrect understanding of the expression's structure and an oversimplification of the rules governing the sequence of operations, both of which are transmitted when dealing with symbolic algebra. They consider that the principles of symbol manipulation are arbitrarily imposed because the principles of transformation have been first officially defined in algebra. However, they are not clear for them since there's no evidence for the law and no confirmation of the rule[6]. Therefore, the reason students are confronted with arbitraryness and meaninglessness in their learning of algebra isn't because of the implementation or focus on the rules for transformation however, rather the absence of focus on the structure of expressions, making connections with the characteristics of operations, as well as explaining the principles like distributivity or associatedity. The problem cannot be solved through manipulating algebraic formulas instead, it demands using specialized exercises that concentrate on providing explanations and encouraging the implementation of these guidelines in class (ibid)[7].

II Literature Survey:

The source for the further research is a review of the relevant literature. It offers solid information on the relevant subject. According to Khanal (2016), research is the systematic exploration of a topic with the goal of advancing knowledge. The systematic identification, location, and analysis of publications providing data relevant to the research subject include the study of related literature (Khanal, 2016).

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The study's primary goals were to identify students' algebra learning challenges and investigate the factors that contribute to these challenges. Several national and international theses and papers have been evaluated for this. The data will be analysed using an interview schedule and class observations as the study's methods, in accordance with the theories of learning disabilities and constructivism.

Reviews of books, theses, journals, articles, the internet, and other sources are covered by empirical reviews. This subject pertains to relevant field research that has been done. This chapter contains several theses and publications that are both national and international. To evaluate individual learning styles, David Kolb created the Learning Style Inventory (LSI) in 1971. Research on the LSI has found four statistically frequent learning styles, which are: diverging, assimilating, convergent, and accommodating. Individuals assessed on the LSI exhibit a wide variety of patterns of scores.

This kind of learner excels at examining tangible issues from a variety of angles.The reason for it being described as "Diverging" is that someone who is a part of it can perform better in situations that demand the development of new ideas for example, an "brainstorming" session.

People who have a different in their learning styles are interested and possess a broad range of interest in the world.

Incorporating (observing and re-evaluating AC/RO) Abstract conceptualization (AC) as well as reflective observation (RO) are two of the principal learning abilities of the learner who is assimilating. Being able to grasp and manage a vast array of information is the best fit for those who have this approach. People who are assimilating tend to be most interested in concepts and abstract ideas more than others. The type of person prefers logical soundness over practicality in the hypothesis. When it comes to careers in research and knowledge that require assimilation, this style of learning is vital. Learners with this type of style like reading

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books, taking seminars, studying analytical models and taking the enough time to think about ideas.

Convergence (acting and considering AC/AE) abstract Conceptualization (AC) along with active Experimentation (E) constitute the primary learning capabilities that are required for learning in the Converging mode. The type of person who learns this style is the best of putting ideas and theories to use in actual situations. They can think of solutions to questions and make decisions from those responses. Learners who are convergent in their approach to learning prefer dealing with tasks and technical difficulties rather than social or interpersonal ones. Their ability to use these capabilities is vital to employment in the field of technology as well as specialized sectors. The kind of person who learns this way likes exploring new ideas and simulations, lab exercises as well as real-world applications.

III Methodology

Structure of the Study

In an investigation researchers conduct the analysis in depth of the case. It usually refers to an event, program or event an activity, process, or more people. Case studies can be described as a type of research design which is found across a variety of fields, such as evaluation. They are limited by the time as well as activity. Researchers collect comprehensive information for a long duration of time using various data collection methods. Instead than focusing on a medical knowledge of impairment, disability inquiry aims to comprehend this population's sociocultural views to empower people to take control of their life (Mertens, 2009 as referenced in Creswell, 2014). My research aims to pinpoint students' struggles with learning algebra in school as well as the root reasons of those struggles. I have used a qualitative approach called a case study. On the basis of the case study's rules and procedures, this study's instructions were all carried out using the qualitative technique. Disability theory and social constructivism will serve as the study's theoretical framework in this instance.

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Case Defendants

Students, math instructors, and parents served as the case study's responders. For the case study, four pupils and one maths instructor will be purposefully chosen from two sample schools. Students who are very unprepared for algebra or who find the subject to be particularly challenging were chosen for the study. The genuine identities of the case respondents are provided as aliases. Source of Data Secondary data was gathered by the visiting principal for anecdotal records of those students (case respondents) which were kept for educational purposes for school and which were crucial for identifying the character and behaviour of students. Primary data came from written tests, field notes from diaries, observation, and interviews.

Data Gathering Instruments

In-depth interviews and observations served as the primary data collection methods for this project due to the case study design, although written tests will also be used to confirm the veracity of respondents' claims.

For every research project, choosing a study design that will effectively aid in addressing the research questions is essential. The research study's assumptions are reflected in the design as well as being one that is best equipped to address the concerns it raises. This encompasses the development of understanding of the subject matter being studied along with the theory and methodological advances in the areas of learning and teaching in education. As time passes, methods for conduct

A majority of the experimental methods that are used for research have changed from being purely quantitative, to qualitative (descriptive research cases studies, descriptive studies.) as well as mixed-method designs. For complex environments such as classrooms, school systems, as well as workplaces, where it's not feasible to give solutions using traditional designs researchers can no longer be content in laboratory experiments that have strict control of parameters. They note that "the demands of teaching and learning, as well as the descriptive, analytical, and communicative needs of the community of researchers, should

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assist in bringing out and testing a range of research methodologies. These techniques might come from both outside the realm of mathematics and science education research (such as ethnography) and inside it (such as teaching experiments, design experiments, and action research) (ibid., pp. 35–36).

Two reasons can be given for the need to alter the design of the study. The first is that there's an growing interest in providing solutions to more complex questions including what happens to learning through events or learning environments inside the classroom in a social-cultural context. The latest research does not just provide evidence-based information on the processes that are being investigated, but also develops theories in the area. Researchers are thought of as an integral part of the system, instead of an external observer and is co-creating knowledge along with participants and instructors within a dynamic environment. The purpose of the research is to understand and define the complexity of the system., create conceptual frameworks for teaching and learning, and examine how participants' conceptualization of the material has changed over time. The information is gathered iteratively across cycles while monitoring complicated activity and acknowledging the theory-laden nature of the research's observation and methodology.

There are several techniques to research the intricate teaching-learning system. This "focus on development within conceptually rich environments that are designed to optimise the chances that relevant developments will occur in forms that can be observed" (ibid., p. 192) is what unites them. Such studies may last anywhere from a few hours to many months, and they can be conducted anywhere from an interview room to a classroom full of students

Analysis sample It is crucial to examine the results of the students whose performance remained consistent throughout the main research despite the trials' continual influx and outflow of students.

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Following the primary investigation, two groups of students

All of the trials, which lasted a year, included participants from two separate schools (E1 and M1). These included 16 children from the school M1 and 15 from the English school E1. Having two groups of students was done to expand the research rather than to compare the two groups. It was interesting and how they would develop over time. The performance of only these pupils who had taken part in all the trails would be the main topic of discussion and tracking in the thesis. This is crucial in order to contain and interpret the massive quantity of data that was produced as a result of the participation of many students in several experiments. An analysis of the performances of students who could not complete all the trials of research would have a lack of certain aspects of the learning procedure due to the design of the study in which the teaching and learning sequence progressed slowly. Because their comments offered insightful feedback in each of the trials, the other students who took part in each trial's development will be taken into account.

However, many fundamental ideas and the accompanying items stayed the same or were comparable from trial to trial while the teaching-learning sequence varied or progressed. Concepts, abilities, and techniques under test included:

evaluation and simplification of algebraic and mathematical expressions,

(ii) completing the blanks to equate two phrases,

(iii) comparing calculations-based and un-calculated expressions,

(iv) determining if one statement is equivalent to others,

(v) using letters to convey basic ideas; and

(vi) context-sensitive problem-solving activities.

The assessments included both multiple-choice questions and questions that needed to be addressed using the working examples. For each choice, the students had to label it as correct or incorrect. The majority of the pre-test questions as well as the ideas and abilities that were taught and learned during the specific trial were included in the post-test for each trial.

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Data evaluation

The type of responses as well as the nature and amount of errors made, as well as student's thinking process as it was determined by their answers to writing tests or the explanations given in the interviews was the focus that were analyzed in the study of information from different sources. This analysis was carried out to assess the extent of the students' understanding of concepts, principles and methods in a variety of areas of work:

Procedures to be understood: Evaluation and simplification of mathematical and algebraic statements

• Guidelines for converting bracketed phrases

•The tasks are based around the equals sign, which is a way of identifying words from a set that match an expression with no computation as well as creating equivalent expressions.

Activities that are based on the context of their task, for example the alphabet-number line pattern, calendar patterns, the Game "Think of a Number," and generalisation of patterns

"Procedural" assignments "procedural" assignments asked the students to apply the concepts and strategies for applying formulas they learned during the course in algebraic and arithmetic expressions for the purpose of producing numbers or simplifying expressions. The guidelines were not followed, the students had to follow them. They may be used procedurally to evaluate or simplify the expressions if they were formulated structurally. The'structural' responsibilities were deemphasized Students' attention was instead directed on understanding the

structure of expressions and recognising relationships both inside and across expressions. The exercises prompted students' intuitive comprehension of

operations and predictions related to basic operations including adding, subtracting, and rearranging phrases, integers, and signs.

The analysis of the various task types aimed to shed light on the students'

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understanding of the following specific topics: Order of Operations, Transformation of words, understanding of expressions, understanding of the "=" sign, the meaning of words, equality and equivalence of letters, thoughts regarding expressing a scenario using the letter and manipulating the word for a final result. The objective was to find out the extent to which students applied their knowledge and the guidelines they were taught during these tests to accomplish the diverse activities, and the degree to which their studies helped in their task's completion. It is contrasted with the literature about the students' difficulties in formal syntactic algebra understanding of expression structure, as well as their comprehension of transformations and equivalence concepts. The data analysis helps determine the effectiveness of the method for moving from arithmetic to algebra utilising "reasoning about expressions" based on syntactic changes. Additionally, it provides a feel of the ideas needed to make the switch from arithmetic to algebra. Students must be able to apply algebra in real-world situations in order to have a thorough comprehension of the subject.

Although it often includes numerous affine subspaces, the set of idempotents in an algebra is not an affine subspace. These affine spaces—which we refer to as idempotent affine spaces in this chapter—are discussed in an associative algebra with unity. In the next chapter, we discuss idempotents in Banach algebras. The main idea is an effort to use concepts from semigroup theory to analyse the characteristics of such spaces. A can refer to an algebraic associative over the field K. It can be either that of the field R of real numbers, or that of complex numbers. C that contains complex numbers which has unity 1 in the sense that it is described in the chapter. If we want to define an affine Subset X of A is designated A by E(X) which is an idempotent set that comprise X and also by A(X) A(X), the affine subspace A which is generated by X. It is common to refer to one-dimensional space affine as lines, and two-dimensional affine spaces planes when we compare them with the geometrical geometry of linear space R 2. R. A(x and A(x,) is

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often referred to as the plane that is defined by x as x, y and z. A(x and z) as the line connecting x and y.) is the line that connects x and y. Furthermore, in such geometric language, the components of A are often referred to as points.

IV Experiments and Results

What's the link between the five parts of the model of problemanalysis and a recognized algebraic measure?

To get the answer to the original question, the data were examined using Pearson's correlation between each part, section, and the Measures of Academic Progress mathematics (MAP-M) Rasch Unit (RIT) RIT score. The relationships between the fundamental skills, algebraic thinking, and content portions are shown in Tables 4 and 5, as well as Table 6. Subsections. This subskill is associated with differ from being very fragile to extremely high. The connection between the ordering of integers and using rational numbers to solve word-problems was the least of the fundamental subskill sections and the connection between arranging rational numbers as well as the use of integers in solving word-problems was the highest. There was a moderate-to significant connection between subskills in the fundamental skill segment, as per the correlations in that section. The section's correlations that deal with algebraic thinking are the highest as well, but they are within the same range in terms of the strongest connections being between patterns as well as algebraic reasoning. The transition from algebra is then from patterns and math. The relationship between proportional thinking and patterns is the closest one. The content part has the lowest section correlations. Problem-solving and conceptual reasoning portions include correlated with a low the ratio of r =.38 while the vocabulary and problem solving sections have the highest correlation that is the highest correlation of r =.43. The relationship between the sections is the least among basic abilities and content. It is the strongest in relation to basic abilities and algebraic thinking as the correlation between these two parts being strong and extremely high.

Table 1 lists the basic skills subsections' Pearson correlations.

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	Integer			Rational		
	Ordering (Order-I)	Calculation (Calc-I)	Word Problem WP- I	Ordering Order-R	Calculation Calc-R	Word Problem WP-R
Order - I	1.00*	.32*	.31*	.33*	.35*	.22*
Calc - I	.32*	1.00*	.55*	.52*	.57*	.46*
WP – I	.31*	.55*	1.00*	.61*	.50*	.56*
Order – R	.33*	.52*	.61*	1.00*	.51*	.59*
Calc – R	.35*	.57*	.50*	.51*	1.00*	.46*
WP - R	.22*	.46*	.56*	.59*	.46*	1.00*

Note. *$p < .01$

Table 2 shows the Pearson correlations between the sections on algebraic thinking.

	Patterns	Arithmetic to Algebra	Generalization	Proportional Reasoning
Patterns	1.00*	.65*	.58*	.55*
Arithmetic to Algebra	.65*	1.00*	.62*	.60*
Generalization	.58*	.62*	1.00*	.62*
Proportional Reasoning	.55*	.60*	.62*	1.00*

Note. *$p < .01$

Table 3 lists the subsections of content knowledge and their Pearson correlations.

	Vocabulary	Conceptual	Problem Solving
Vocabulary	1.00*	.40*	.43*
Conceptual	.40*	1.00*	.38*
Problem Solving	.43*	.38*	1.00*

Note. *$p < .01$

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Table 4 shows the sections' Pearson correlations.

	Basic Skills	Algebraic Thinking	Content Knowledge
Basic Skills	1.00*	.76*	.54*
Algebraic Thinking	.76*	1.00*	.62*
Content Knowledge	.54*	.62*	1.00*

Note. *$p < .01$

For the test's individual parts and overall score in connection to the Measures of Academic Progress (MAP) rating, Pearson correlations were computed. Basic Skills r (325) =.71, p.001; Algebraic Thinking r (325) =.76, p.001; and Content Knowledge r (325) =.68, p.001 were the three components' correlations with the MAP exam. The overall score and the MAP had a correlation of r (325) =.79, p.001. Table 8 displays the relationships between the Engagement and Authentic Application sections' scores, the overall composite score, and the MAP scores. Authentic Application and Engagement links are sometimes weaker than linkages between academic skill areas.. These components feature connections that range in strength from very low to very high. However, there is a strong link (.79) between the MAP mathematics test and the assessment's total sum result.

Table 8 : Pearson Correlations of the MAP, Engagement, Authentic Application, and Total Scores

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	Positive	Negative	C	A	BC	BEP	D	MAP	Total
Positive	1.00*	-0.78*	0.37*	0.48*	0.38*	0.42*	-0.31*	0.15*	0.24*
Negative	-0.78*	1.00*	-0.33*	-0.50*	-0.35*	-0.41*	0.35*	-0.18*	-0.23*
C	0.37*	-0.33*	1.00*	0.43*	0.51*	0.53*	-0.29*	0.09	0.13
A	0.48*	-0.50*	0.43*	1.00*	0.43*	0.60*	-0.39*	0.06	0.12
BC	0.38*	-0.35*	0.51*	0.43*	1.00*	0.55*	-0.42*	0.24*	0.22*
BEP	0.42*	-0.41*	0.53*	0.60*	0.55*	1.00*	-0.30*	0.12	0.17*
D	-0.31*	0.35*	-0.29*	-0.39*	-0.42*	-0.30*	1.00*	-0.04	-0.08
MAP	0.15*	-0.18*	0.09	0.06	0.24*	0.12	-0.04	1.00*	0.79*
Total	0.24*	-0.23*	0.13	0.12	0.22*	0.17*	-0.08	0.79*	1.00*

Note. Positive = Positive Mindset; Negative = Negative Mindset; C = Cognitive Engagement; A = Affective Engagement; BC = Behavioral Engagement Compliance; BEP = Behavioral Engagement Participation; D = Disengagement; MAP = Measures of Academic Progress Mathematics RIT Score; Total = Total Score for combined Basic Skills, Algebraic Thought, and Content Knowledge sections.
*$p < .01$

V Conclusion:

The findings show that Basic Skills has the highest relationship to Algebraic Thinking and the least relationship to Content Knowledge.

Based on the analysis of the five-factor theory, it is possible to conclude that each subskill and skill offers a distinct collection of data about distinct math skills which are essential in the development of algebra. The correlations indicate that subskills have a relationship with each other. The subskill measures within every subskill exhibit a weak or medium relationship. The general abilities are more of a connection than subskills. The highest relationship between the basic Skills as well as Algebraic Thinking among the

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sections indicates that the ability of students to organize, calculate and work through word problem involving rational numbers is directly linked with their ability to complete algebraic thinking exercises. Their capacity to use content knowledge to remember information and solve issues seems to be less impacted by these abilities. The fact that children may not employ their algebraic calculation abilities directly but do so while honing skills linked to arithmetic thinking is one potential explanation for the lesser association.

VI References:

[1]http://www.math4all.in/public_html/linearalgebra/chapter3.4.html.

[2] http://homotopytypetheory.org/.

[3] Archive of Formal Proofs. http://afp.sourceforge.net/.

[4] Immutable Arrays in Haskell. https://downloads.haskell.org/~ghc/6.12.1/docs/html/libraries/array-.3.0.0/Data-Array-IArray.html.

[5] Matlab documentation. Definition of Hermite Normal Form. http://es.mathworks.com/help/symbolic/hermiteform.html#butzrp_-5.

[6] The Isabelle website. https://isabelle.in.tum.de/.

[7] ARIANE 5 Flight 501 Failure. Report by the Inquiry Board, 1996. https://www.ima.umn.edu/~arnold/disasters/ariane5rep.html.

[8] S. Adelsberger, S. Hetzl, and F. Pollak. The Cayley-Hamilton Theorem.Archive of Formal Proofs, 2014. http://afp.sf.net/entries/Cayley_Hamilton.shtml, Formal proof development.

[9] J. Aransay and J. Divas´on. Formalizing an abstract algebra textbook inIsabelle/HOL. In Juan Rafael Sendra Pons and Carlos Villarino Cabellos,editors, Proceedings of the XIII Spanish Meeting on Computer Algebra andApplications (EACA 2012), pages 47 – 50, 2012.

[10] J. Aransay and J. Divas´on. Formalization and execution of Linear Algebra: from theorems to algorithms. In G. Gupta and R. Pe˜na, editor,PreProceedings of the International Symposium on Logic-Based Program Synthesis and Transformation: LOPSTR 2013, pages 49 – 66, 2013.

[11] J. Aransay and J. Divas´on. Performance Analysis of a Verified Linear Algebra Program in SML. In L. Fredlund and L. M. Castro, editors, V Taller de Programaci´on Funcional: TPF 2013, pages 28 – 35, 2013.

INTERNATIONAL JOURNAL OF TECHNO-ENGINEERING
IJTE
ISSN: 2057-5688

[12] J. Aransay and J. Divas´on. Formalization and execution of Linear Algebra: from theorems to algorithms. In G. Gupta and R. Pe˜na, editors, PostProceedings (Revised Selected Papers) of the International Symp osium on Logic-Based Program Synthesis and Transformation: LOPSTR 20

[13] J. Aransay and J. Divas´on. Formalisation in higher-order logic and code generation to functional lan guages of the Gauss-Jordan alg orithm. Journal of Functional Prog ramming, 25, 2015. doi:10.1017 /S0956796815000155.

[14] J. Aransay and J. Divas´on. Generalizing a Mathematical Analysis Library in Isabelle/HOL. In K. Havelund, G. Holzmann, and R. Joshi, editors, NASA Formal Methods, volume 9058 of LNCS, pages 415–421. Springer, 2015.

[15] J. Aransay and J. Divas´on. Proof Pearl - A formalisation in HOL of the Fundamental Theorem of Linear Algebra and its application to the solution of the least squares problem. Draft paper, 2015. https://www.unir ioja.es/cu/jodivaso/publications/2015/ Least_Squares_2015.pdf.

[16] J. Aransay and J. Divas´on. Verified Computer Linear Algebra. In Accepted for presentation at the XV Spanish Meeting on Computer Algebra and Applications (EACA 2016), 2016.

[17] J. Aransay and J. Divas´on. Formalisation of the Computation of the Echelon Form of a matrix in Isabelle/HOL. Accepted for public ation in Formal Aspects of Computing, 2016. http://www.unirioja.es/cu/jodivaso/pub lications/2016/echelon_FAC_draft.pdf.

[18] J. Aransay, J. Divas´on, and J. Rubio. Formalising in Isabelle/HOL a simplicial model for Homotopy Type Theory: a naive approach. 2015. http://www.unirioja.es/cu/jodivaso/pub lications/2016/hott_draft_2016.pdf, Draft paper.

[19] J. Aransay-Azofra, J. Divas´on, J. Heras, L. Lamb´an, M. V. Pascual, A. L. Rubio, and J. Rubio. Obtaining an ACL2 specification from an ´Isabelle/HOL theory. In Gonzalo A. Aranda-Corral, Jacques Calmet, and Francisco J. Mart´ın-Mateos, editors, Artificial Intelligence and Symbolic Computation - 12th International Conference, AISC 2014, Seville, Spain, December 11-13, 2014. Proceedings,

INTERNATIONAL JOURNAL OF TECHNO-ENGINEERING
IJTE
ISSN: 2057-5688

volume 8884 of Lecture Notes in Computer Science, pages 49–63, 2014.

[20] J. Avigad and J. Harrison. Formally Verified Mathematics. Communications of the ACM, 57(4):66 – 75, 2014.

[21] J. Avigad, J. H¨olzl, and L. Serafin. A formally verified proof of the Central Limit Theorem. CoRR, abs/1405.7012, 2014.

[22] S. Axler. Linear Algebra Done Right. Undergraduate Texts in Mathematics. Springer-Verlag, 2nd edition, 1997.

[23] C. Baier and Joost-Pieter Katoen. Principles of model checking. MIT Press, 2008.

[24] C. Ballarin. Locales: A module system for mathematical theories. Journal of Automated Reasoning, 52(2):123–153, 2014.

[25] K.J. Bathe. Computational Fluid and Solid Mechanics. Elsevier Science,2003.

[26] BBC news. Airbus A400M plane crash linked to software fault. http://www.bbc.com/news/technology-32810273.

[27] L. W. Beineke and R. J. Wilson. Topics in Algebraic Graph Theory.Encyclopedia of Mathematics and its Applications. Cambridge University Press, 2004.