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DISTRIBUTION TREN OF SENIOR HIGH SCHOOL AS ORIGIN SCHOOL OF COLLEGE STUDENT STIKOM BALI BASE GIS

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Abstract:

GIS (Geographic Information System) is an information system that can store and integrate spatial data and non-spatial data can be used for interactive mapping of STIKOM Student School origin in Denpasar. During this time the spread of origin of high school / vocational school / equivalent STIKOM Bali students has never been mapped to find out the trend of increase or decrease in the number of origin of STIKOM Bali student schools from 2013-2018 and predict the number of students in accordance with the origin of schools in the city of Denpasar. This study aims to provide information to the management of STIKOM Bali regarding the distribution trends of the interests of prospective students to continue to tertiary level, especially STIKOM Bali. This research will collaborate between statistical science and the concept of GIS (Geographic Information System). Statistically the number of STIKOM Bali students is based on the origin of schools in Denpasar City and predicts it for the next 3 years using a trend analysis of semi-average methods (Semi Average Methods) as a material for evaluating the performance of STIKOM Bali management in improving the performance of campus promotions. This method makes trends by finding the average group of data which consists of grouping data into 2 parts, calculating average arithmetic, calculating the difference, formulating the value of change and making equations for subsequent trends. The results of these calculations are mapped with the concept of GIS (Geographic Information System) using ArcView as software to implement that integrates spatial data with non-spatial data.

Keywords: GIS (Geographic Information System); Arc View; Semi Average Methods.

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1. Introduction

Geographic Information System can be used as a main tool that is many interactive, interesting and challenging in an effort to increase understanding, learning and education about ideas or concepts of location, space, population and geographical elements contained on the surface of the earth (Prahasta, 2014).

In accordance with the concept of GIS (Geographic Information System) can be used for interactive mapping of STIKOM Student schools in Denpasar. During this time the spread of

origin of high school / vocational school / equivalent STIKOM Bali students has never been mapped to know the trend of increase or decrease in the number of origin of STIKOM Bali student schools from 2013-2018 and predict the number of students in accordance with the origin of schools in Denpasar. This study aims to provide information to the management of STIKOM Bali regarding the trends in the distribution of interest of prospective students to continue to tertiary levels, especially STIKOM Bali so that it can be used as material for performance evaluation by predicting the amount of increase / decrease asking prospective students.

This research will collaborate between statistical science and the concept of GIS (Geographic Information System). Statistically the number of STIKOM Bali students is based on the origin of schools in Denpasar City and predicts it for the next 3 years using a semi-average method analysis. This method makes trends by finding the average group of data which consists of grouping data into 2 parts, calculating the average count, calculating the difference, formulating the value of change and making equations for the next trend (S.K, 2016).

The results of forecasting calculations are mapped with the concept of GIS (Geographic Information System) using ArcView as software to implement that integrates spatial data with non-spatial data

2. Materials and Methods

2.1. Methods

The flow of analysis from the research of the STIKOM Bali School of Origin Student Distribution Based on the Geographic Information System, consists of several stages of activities along with an explanation as follows:
1. Literature Study
The first stage is reading reference books and journals related to Geographic Information System theory, statistical theory and so on.
2. Data Collection
The second process is the process of collecting data from STIKOM student schools for the list of the last 5 years from 2013-2018.
3. Data Analysis
The data that has been collected is analyzed by grouping data from STIKOM Bali student schools based on the area of Denpasar City.
4. Statistical Data Calculation Process
The step in calculating statistical data using the semi average method analysis is used to evaluate management performance in terms of socializing the STIKOM Bali campus so that it can be used as a guide in making decisions for planning to improve management performance to increase the number of prospective students.
5. Making the Dissemination Map
The final step is to make a distribution map by digitizing digital maps using Arcview software.

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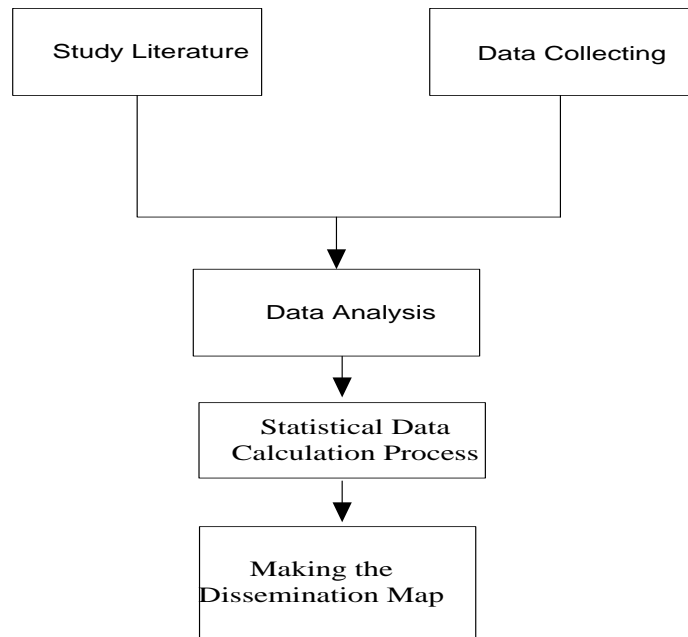
Figure 1: Systematic Research

2.2. Geographic Information System Learning

Geographic Information System (GIS) consists of three terms namely System, Information and Geographic is a collection of components or elements that are interconnected between components / elements to achieve the goal (Prahasta, E.2005). The concept of Information is the result of data processing and geography is the study of the earth's surface. The concept of Geographic Information System (GIS) is a collection of components that interact with each other in data processing so as to produce geographic information which is implemented in the form of digital maps. Geographic information systems can also be defined as an information system that can analyze, store, update, integrate and display all forms of information relating to the surface of the earth.

The existence of an efficient Geographic Information System (GIS) and able to manage data with complex structures and with large numbers can help in the decision-making process. There are several reasons why the concepts of geographic information systems and their applications become interesting for use in various disciplines are as follows (Prahasta, E.2005).

2.3. Semi Average Methods

A trend is a long-term upward or downward movement that is obtained from the average change over time and the value is quite flat or smooth (Suharyadi. Purwanto S.K, 2016). Periodic data trends can take the form of trends that increase and decrease smoothly. A trend that increases in value is called a positive trend and a downward trend is called a negative ren. Trends show

relatively long and stable changes in time. The forces that can influence trends are changes in population, prices, technology and productivity.

Analysis of past data is very important because human behavior is affected by previous conditions or times (Gujarati, 1995). For example, why do people buy up rice? because previously the data has gone up. Therefore, a company, a person or a particular institution in the decision-making is based on data and previous conditions. Periodic series can be used to predict the state of things to come. Periodic series have four components, namely trends (trends), season variations, cycle variations, and irregular variations. The trend analysis method used in the study entitled "Distribution Trend of STIKOM Bali School of Origin Students Based on Geographic Information System" is a semi-average method. The semi-average method makes trends by finding the average group of data. The steps in obtaining a trend line with this method are:

1) Grouping data into two parts. If the amount of data is odd, the middle value can be eliminated or counted twice, namely 1 part being the first group and 1 part being the second group

2) Calculate the average of the first group K1 and group K2. K1 is placed in the middle year in group 1 and K2 is placed in the middle year in group 2. The values of K1 and K2 are constants (a) and the location of the year is the base year. The values of K1 and K2 become intercepts in the trend equation.

3) Calculates the difference K2-K1, if K2-K1> 0 means a positive trend and if K2 <K1, then the trend is negative. The value of the trend change (b) is obtained by means of b = (K2-K1) / (base year 2-base year 1)

4) The value of the trend change (b) is obtained by means of

$$b = \frac{K2 - K1}{base\ year\ 2 - best\ year\ 1}$$

5) Find out the magnitude of the next trend by entering the value (X) in the equation Y '= a + bX that already exists.

3. Results and Discussions

3.1. Student Data Grouping

The first thing to do in this study is to group the amount of student data based on the origin of schools in the Denpasar City area. The results of the grouping can be seen in table 1.

Table1 : Grouping Number of Student Data Based on the Origin of Schools in Denpasar City

No	School Origin	Years					
		2013	2014	2015	2016	2017	2018
1	SMA Saraswati 1 Denpasar	3	2	3	7	8	13
2	SMA Dwijendra	6	5	5	15	17	19
3	SMA PGRI 2 Denpasar	2	1	3	8	6	5
4	SMA PGRI 4 Denpasar			4	5	6	3
5	SMA PGRI 6 Denpasar	1	1	3	2		2
6	SMA Taman Rama	1		1	2	1	
7	SMA 3 Denpasar				3	2	1

8	SMKN 4 Denpasar		1	3	3	4	
9	SMKN 3 Denpasar	1	0	0	4	4	2
10	SMKN 1 Denpasar	12	12	15	48	25	35
11	SMK TI Bali Global	15	22	34	158	110	133
12	SMA N 8 Denpasar	4	3	5	7	5	12
13	SMA N 7 Denpasar	1	1	3	10	10	15
14	SMA N 6 Denpasar	3	0	6	22	9	16
15	SMA N 5 Denpasar	3	4	3	15	10	4
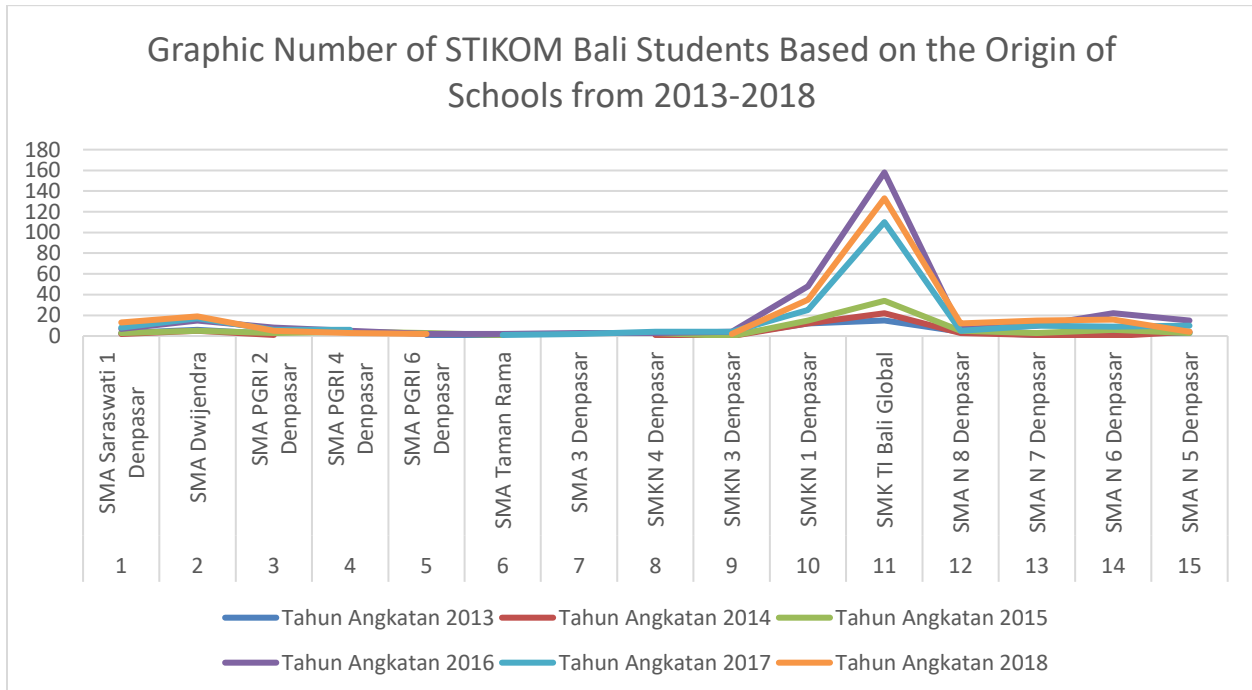
Figure 1 : Graphic Number of STIKOM Bali Students Based on the Origin of Schools from 2013-2018

In figure 1 it can be seen that the highest number of private schools from STIKOM Bali students from 2013-2018 came from SMK IT Bali Global, with the highest peak in 2016 with 158 students. The most number of public schools that continue to STIKOM Bali are SMKN 1 Denpasar which tends to rise

3.2. Forecasting Results

The result of forecasting using the semi-average trend method for the origin of the SMA PGRI 4 Denpasar High School as a representative of the other high schools is as follows:

Table 2 :Forecasting Trend Number of Students from SMA PGRI 4 Denpasar High School

Years	Number of Students	Average	X value for the 2014 base year	X value for 2017 base year
2013	0		-1	-4
2014	0	1.3	0	-3

2015	4		1	-2
2016	5		2	-1
2017	6	4.7	3	0
2018	3		4	1
Forecasting				
2019	7		5	2
2020	8		6	3
2021	9		7	4
2022	10		8	5
2023	11		9	6

K1 = a1 = 0+0+4/3 = 1.3

K2 = a2 = 5+6+3/3 = 4.7

b = K2-K1/base year 2-base year 1 = 4.7-1.3/2017-2014 = 3.4/3 = 1.1

Trend equation

Y' = 1.3 + 1.1X (base year2014)

Y' = 4.7 + 1.1X (base year2017)

Calculation of the number of student forecasting in the year 2019-2023

(1) The equation for the 2014 base year

(2) The 2017 base year equation

The following is the calculation of forecasting the number of STIKOM Bali students coming from SMA PGRI 4 Denpasar in 2019

(1) Y' = 1.3 + 1.1X

$\qquad$ = 1.3 + 1.1(5)

$\qquad$ = 1.3 + 5.5

$\qquad$ = 6.8

$\qquad$ = 7

(2) Y' = 4.7 + 1.1X

$\qquad$ = 4.7 + 1.1(2)

$\qquad$ = 4.7 + 2.2

$\qquad$ = 6.9

$\qquad$ = 7

Calculation of forecasting the number of STIKOM Bali students coming from SMA PGRI 4 Denpasar in 2020

(1) Y' = 1.3 + 1.1X

$\qquad$ = 1.3 + 1.1(6)

$\qquad$ = 1.3 + 6.6

$\qquad$ = 7.9

$\qquad$ = 8

(2) Y' = 4.7 + 1.1X

$\qquad$ = 4.7 + 1.1(3)

$\qquad$ = 4.7 + 3.3

$\qquad$ = 8

Calculation of forecasting the number of STIKOM Bali students coming from SMA PGRI 4 Denpasar in 2021

(1) Y'   = 1.3 + 1.1X
        = 1.3 + 1.1(7)
        = 1.3 + 7.7
        = 9
(2) Y'   = 4.7 + 1.1X
        = 4.7 + 1.1(4)
        = 4.7 + 4.4
        = 9.1
        = 9

Calculation of forecasting the number of STIKOM Bali students coming from SMA PGRI 4 Denpasar in 2022

1) Y'   = 1.3 + 1.1X
        = 1.3 + 1.1(8)
        = 1.3 + 8.8
        = 10.1
        = 10
(2) Y'   = 4.7 + 1.1X
        = 4.7 + 1.1(5)
        = 4.7 + 5.5
        = 10.2
        = 10

Calculation of forecasting the number of STIKOM Bali students coming from SMA PGRI 4 Denpasar in 2023

1) Y'   = 1.3 + 1.1X
        = 1.3 + 1.1(9)
        = 1.3 + 9.9
        = 11.2
        = 11
(2) Y'   = 4.7 + 1.1X
        = 4.7 + 1.1(6)
        = 4.7 + 6.6
        = 11.3
        = 11

Based on the calculation of forecasting the number of STIKOM Bali students based on the origin of the school. Following is a table of the overall origin of schools in Denpasar, which is predicted the number of students from 2019-2023 seen in table 3.

Table 3: Results of Forecasting the Number of Students STIKOM Bali Based on the Origin of Schools

No	School Origin	Forecasting Year				
		2019	2020	2021	2022	2023
1	SMA Saraswati 1 Denpasar	14	16	18	20	23
2	SMA Dwijendra	25	29	33	37	40
3	SMA PGRI 2 Denpasar	9	11	12	13	15
4	SMA PGRI 4 Denpasar	7	8	9	10	11
5	SMA PGRI 6 Denpasar	1	1	1	1	1
6	SMA Taman Rama	1	1	1	2	2
7	SMA 3 Denpasar	3	4	5	5	6
8	SMKN 4 Denpasar	3	4	5	5	6
9	SMKN 3 Denpasar	5	6	7	8	9
10	SMKN 1 Denpasar	51	59	67	75	82
11	SMK TI Bali Global	207	244	280	317	354
12	SMA N 8 Denpasar	11	12	13	15	16
13	SMA N 7 Denpasar	18	22	25	28	32
14	SMA N 6 Denpasar	24	28	32	37	41
15	SMA N 5 Denpasar	14	16	18	20	23

3.3. GIS Implementation

This sub-chapter shows the results of implementation with ArcView as a Geographic Information System-based software. Figure 3 is the result of digitizing the location of schools from each high school or equivalent in the city of Denpasar. School locations are grouped by district in Denpasar City.
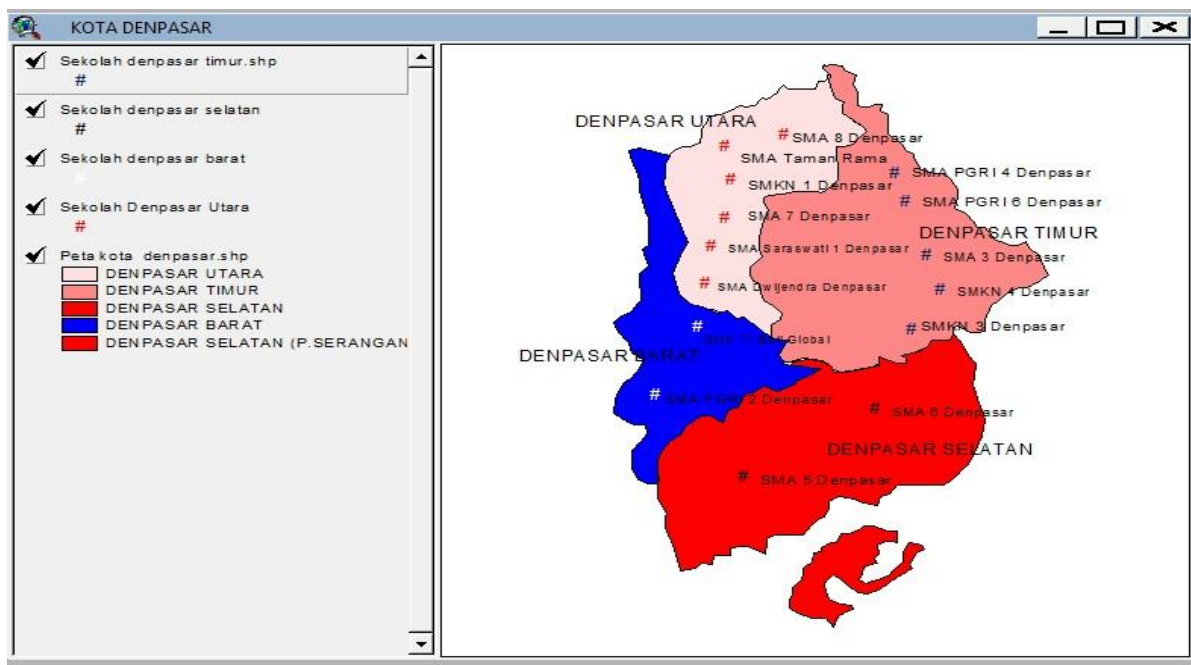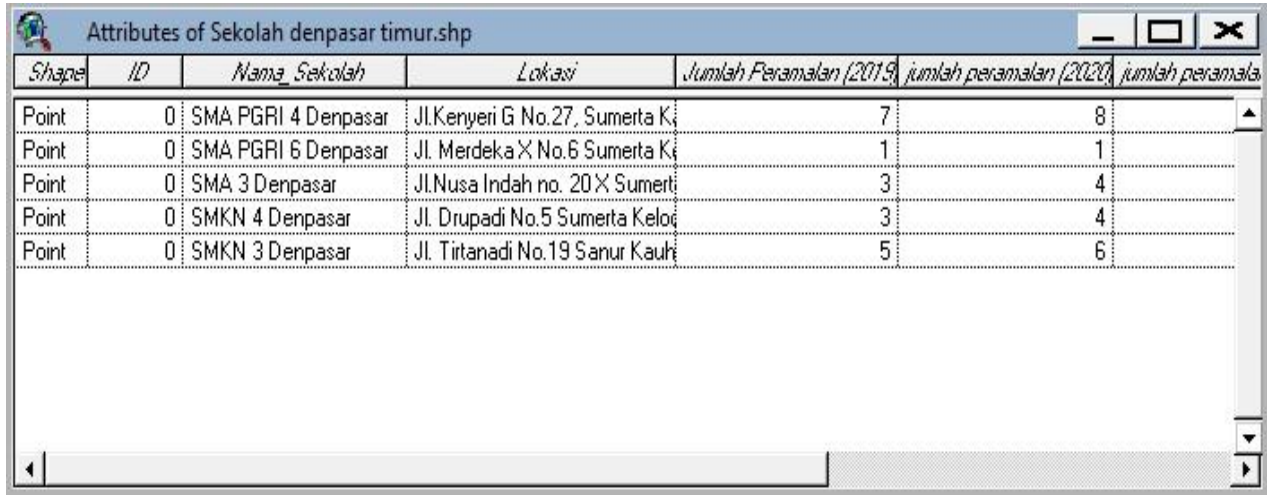

Figure 3: Digitizing Origin of STIKOM Bali Student School Denpasar City

In Figure 4 is a table for the implementation of forecasting the number of students from 2019-2023 from schools in East Denpasar District. Schools located in East Denpasar consist of 5 schools, namely SMA PGRI 4 Denpasar, SMA PGRI 5 Denpasar, SMA 3 Denpasar, SMK 4 Denpasar and SMKN 3 Denpasar. The highest number of forecasting was found in SMA PGRI 4 Denpasar.

Shape	ID	Nama_Sekolah	Lokasi	Jumlah Peramalan (2019)	jumlah peramalan (2020)	jumlah peramala
Point	0	SMA PGRI 4 Denpasar	Jl.Kenyeri G No.27, Sumerta K,	7	8	
Point	0	SMA PGRI 6 Denpasar	Jl. Merdeka X No.6 Sumerta Ke	1	1	
Point	0	SMA 3 Denpasar	Jl.Nusa Indah no. 20 X Sumert	3	4	
Point	0	SMKN 4 Denpasar	Jl. Drupadi No.5 Sumerta Keloc	3	4	
Point	0	SMKN 3 Denpasar	Jl. Tirtanadi No.19 Sanur Kauh	5	6	

Figure 4 : Forecasting Implementation in ArcView GIS from School in East Denpasar

In Figure 4 is a graph of forecasting the number of students found in each school in the District of East Denpasar. Based on the graph, the graph that shows the highest number of student forecasting comes from SMA PGRI 4 Denpasar from 2019-2023.
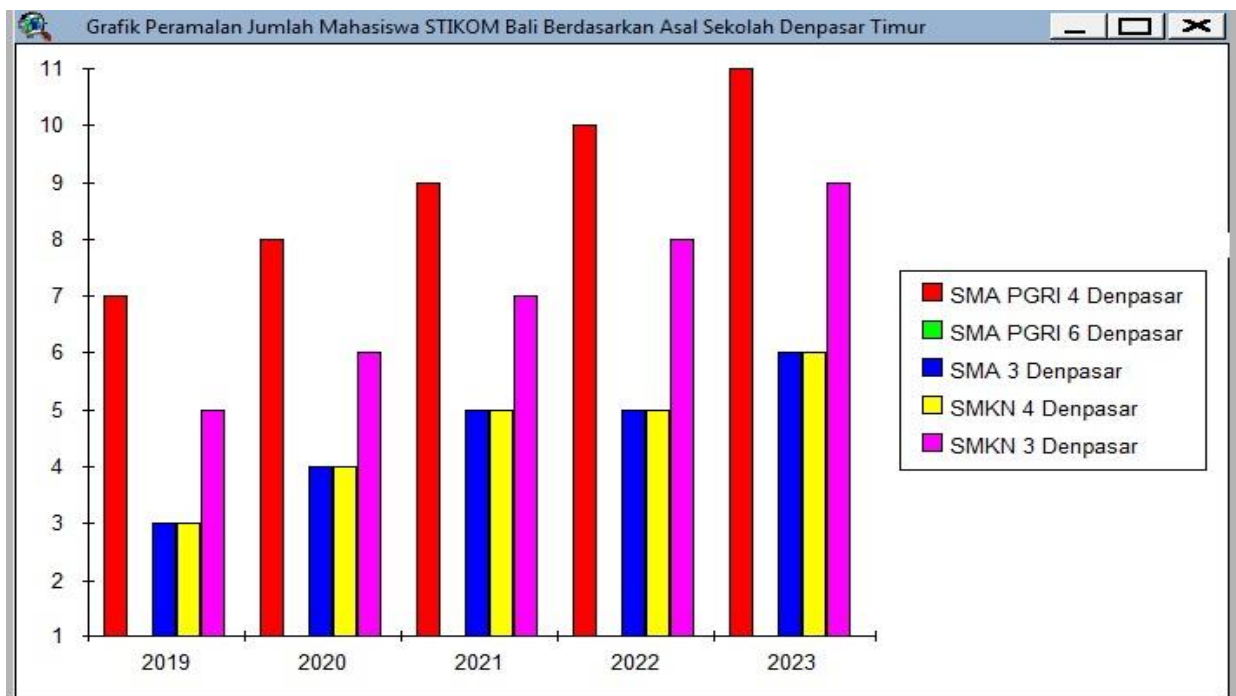

Figure 5: Graphic Forecasting the Number of Students Based on the Origin of Schools in East Denpasar

4. Conclusions and Recommendations

Based on data obtained from the origin of high school or equivalent, 15 schools originating from STIKOM Bali obtained various amounts. To find out trends / trends of the number of students from 2019-2023, the number of students who continue to STIKOM Bali from 2019-2023 is forecasted using a quantitative method (semi-average trend).

Based on the results of research from forecasting the number of students based on the origin of the most dominating schools are SMK IT Bali Global and SMK N 1 Denpasar because this school is a vocational school based on Information Technology so it can facilitate prospective students to continue their education to universities based on Information Technology as well. This can be used as an evaluation for the management of STIKOM Bali to think of other schools that are public or non-Information Technology to be open-minded in continuing to school based on Information Technology. Through implementation using GIS (Geographic Information System) makes it easy to find out the spread of high school or equivalent who have continued their education to STIKOM Bali so that management can provide socialization to other schools in the city of Denpasar to be interested in continuing to STIKOM Bali as a campus based Information Technology.

Acknowledgements

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