Correlation Analysis between Speed Bumps Dimensions and Motorcycle Speed in Residential Area

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Introduction

Let’s start with the first set of slides







In Surakarta residential area, speed bumps with various dimension was intalled as traffic calming measure by the community for reduce vehicle speed in order to protect the citizen safety.

researchers want to know how the model of correlation between variations of the speed bumps dimension that installed in the residential area of Surakarta and the motorcycle speed before passing speed bumps

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Theory and Method

Let’s start with the second set of slides

Speed Bumps

Speed bumps or speed control is elevated road section in the form of additional asphalt , rubber, or other material such as concrete that installed across the road to sign the driver to reduce vehicle speed.

Installation and Placement

Speed control device are usually installed under [KM no.3, 1994] as follows:

- Placed on residential roads,
- Local road with IIIC,
- On existing road of construction works.

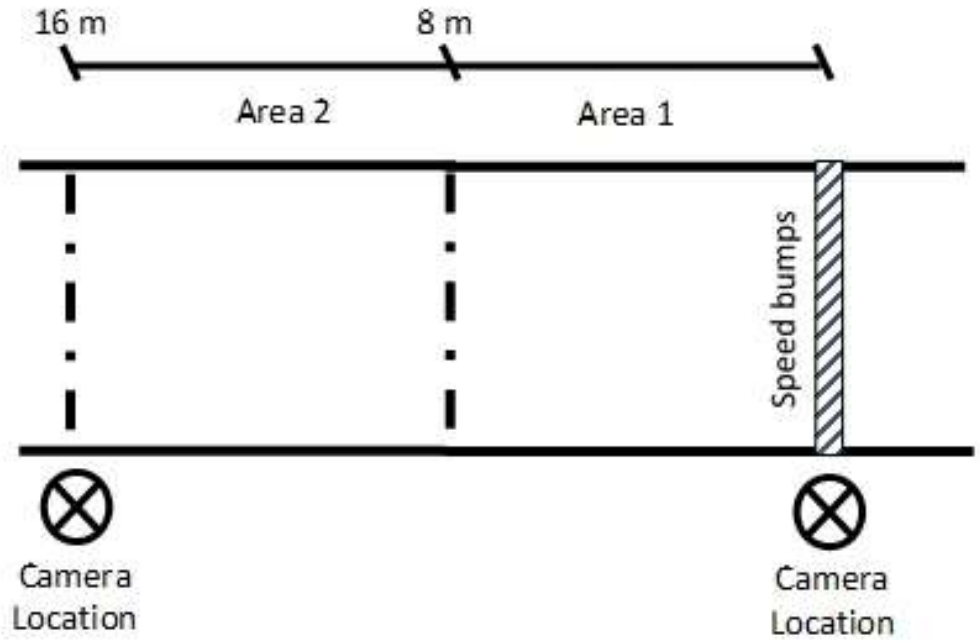
Speed bumps are only used on some road condition [Wolfgang,1992] as follows:

- Road function only serves local access,
- Has no more than one road lane each direction,
- The road not a trucking route or transit,
- The location not close to the fire department, police office or hospital,
- The road not an area with traffic speeds above 25 mph or 40 km/h.

Method

The location used in the research was the residential area where often found speed bumps under the condition as follow:

- Only found single speed bumps made of concrete or cement
- The road width ± 3 m
- The speed used was motorcycle speed before passing speed bumps



The data collection by record using camera that placed at point camera location as shown in Figure. Then dash line indicate location of artificial line, in field the artificial line was marked by tape to identify the distance . The survey was conducted in 5 selected locations.

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Result and Discussion

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Obtained 150 motocycle speed data sample from 5 locations surveyed where each location was taken 30 data sample of motocycle drivers.

Street Name	Average speeds before Speed Bumps (km/h)		Height of Speed Bumps (cm)	Width of Speed Bumps (cm)
	$V_{area\ 1}$ (Km/h)	$V_{area\ 2}$ (Km/h)		
Jl. Sekar Jagad IV	11.66	21.22	6.5	50
Jl. KP Kadirejo	12.27	23.33	3.5	33
Jl. KP Sewu	11.18	22.28	5.5	57
Jl. Parang Kusumo	14.30	25.53	3	32.6
Jl. Mojopahit 1	11.80	24.54	4	34.8

The data in **Table** used for correlation test as preliminary analysis to know the correlation between variables.

Correlation Analysis Result

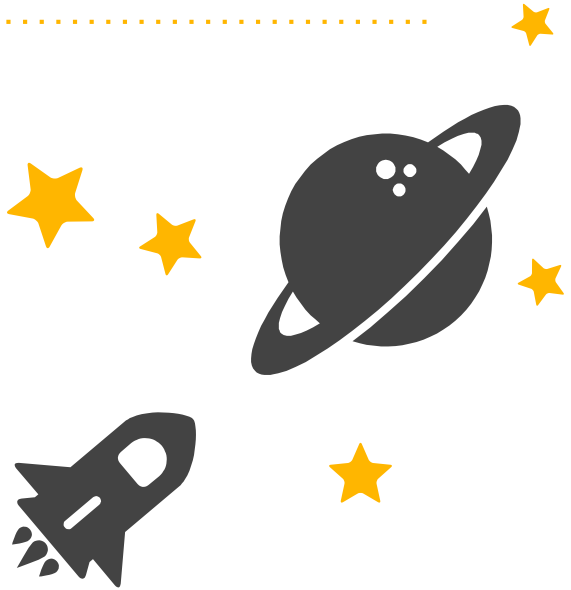
	Y ($V_{area\ 1}$)	Y ($V_{area\ 2}$)	X_1	X_2
X_1	-0.723	-0.914	1	0.877
X_2	-0.675	-0.797	0.877	1

The High (X_1) and the width (X_2) of speed bumps had a strong correlation so one must be eliminated. Then its find variable X_1 had greater correllation with $V_{area\ 1}$ and $V_{area\ 2}$ so variable X_2 was eliminated.

Before the regression analysis had done the linearity test where the correlation X and Y spread in the graph and obtainded that the spread of data does not linear so the analysis used non linear regresision analysis.

The selected variable X_1 (High of speed bumps) was analize using regression analysis quadratic model and test of determination coefficient (R^2) to Y (speed) to find out the analysis regression obtained:

- $V_{area\ 1}$ (8m before speed bumps) equal to 0,926
- $V_{area\ 2}$ (from 8-16m before speed bumps) equal to 0,837.
- From the results obtained $V_{area\ 1}$ had a strong correlation with high dimension speed bumps variable X_1.



To know

the independent variables significantly influence the dependent variable, ANOVA analysis were done by comparing F_{table} with F_{count}. Then the value of $F_{count} > F_{tabel}$ as 12,537> 9,000 indicate that X_1 effect on Y.

The mathematics model for the motorcycle average speed on area 1 (Y) with independent variable high dimension of speed bumps (X_1) as bellow:

$$Y = 27{,}821 - 6{,}461\ X_1 + 0{,}615\ X_1^2$$

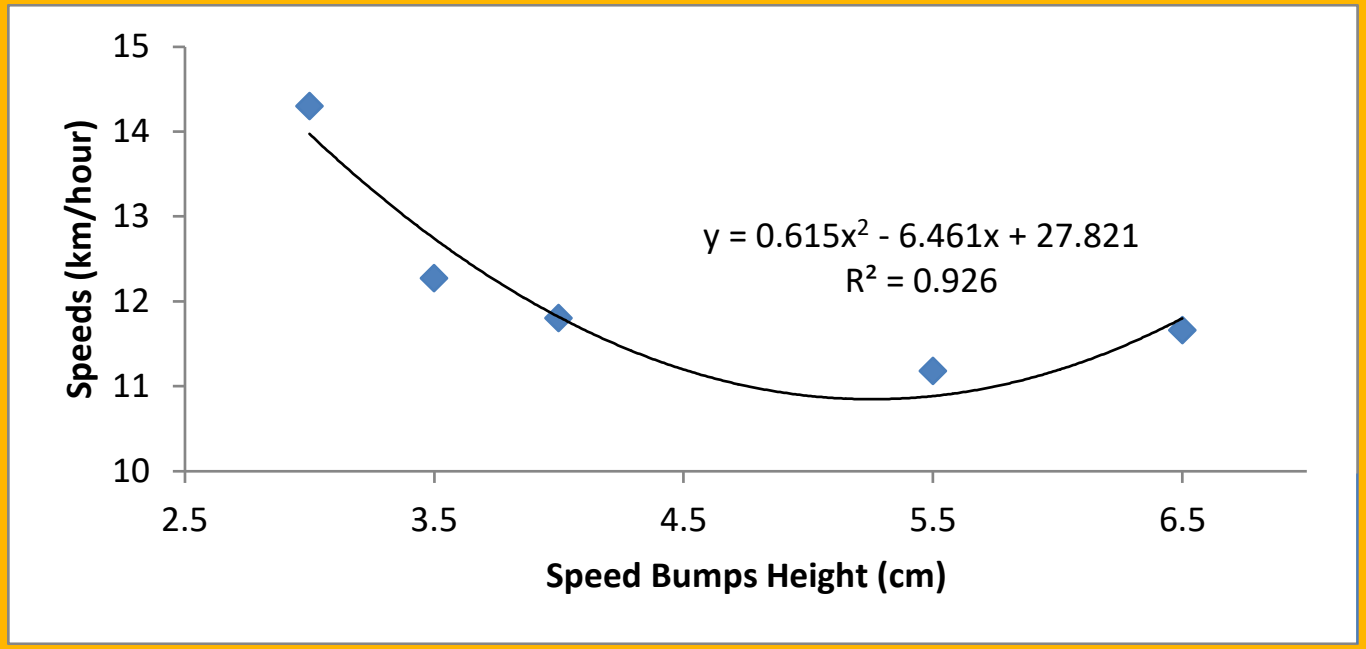


Chart of Test Best Regression Model correlation between $V_{area\ 1}$ with X_1 High of speed bumps

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Conclusion

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The analysis with the non – linier regression of quadratic model found that High of Speed Bumps (X_1) descrease motocycle speed (Y) as in the matematic model bellow:

$Y = 27,821 - 6,461\ X_1 + 0,615\ X_1^2$ with R^2 equal to 0,926

And this model valid for height bumps (smaller than or equal to) ≤ 5,2 cm.

For further research it necessary to analyze the correlation between speed bumps dimension design and speed reduction effect from the design to obtained the optimal speed bumps dimension design.

Thank You

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