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USS3

USS3

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/ RMSE

/ RMSE /

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. (Shariati, 2004)

() Cho & Ki

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() Shin & Kim

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() Singh et al. .

: (Seidi, 2005)

/ / /

Karparvar .

() Bayati () Fard

() Alimardani et al. .

Seidi .

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"

() Aghkhani & Abbaspour Fard . "

:(Tillett, 1991)

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1. Dead Reckoning
 2. Machine Vision
 3. Global Positioning System(GPS)
 4. Orientation
 5. Position

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(Barawid et al., 2007) ()

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$$\varphi = (\theta + \tan^{-1}(\frac{e}{l})) \rightarrow \alpha = \tan^{-1}(\frac{e}{l}) \ \& \ \phi = -(\theta + \alpha)$$

θ () ϕ

1 () e ()

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(V_R) (V_L)

$$(V_{R,L} \propto f(\phi))$$

()

() Best Technology

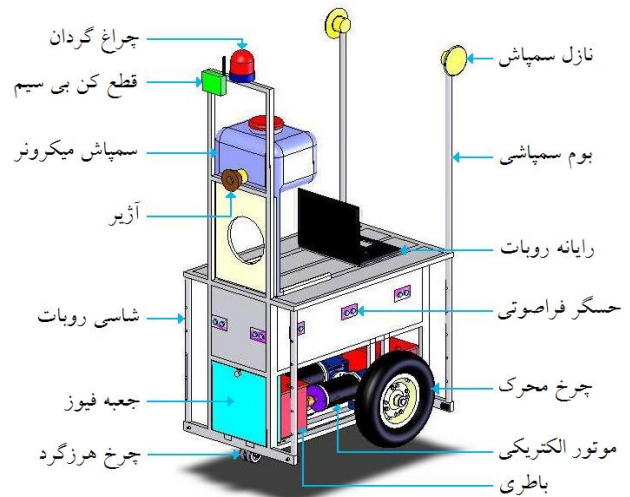
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(Gray, (CCD ()

2000)

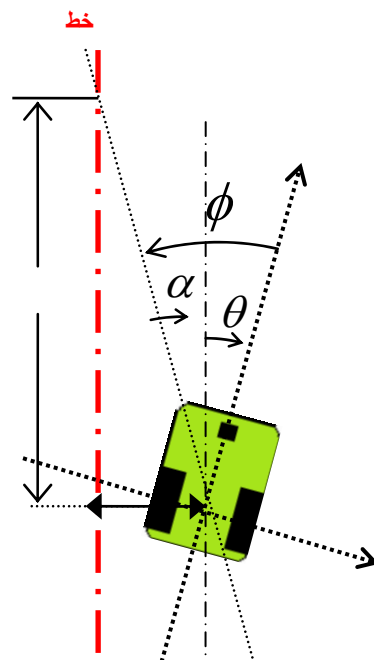


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(e) (θ)

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(Barawid et al., 2007)()

Vehicle Robotics

USS3



USS3

(Best Technology Company, 2008)

USS3

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C++

Visual Studio 2008

(Disto pro4a, Leica Geosystems Co.)

13. Axial laser range finder

USS3

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RS485

14. Response frequency
15. Digital packet

C++

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Visual Studio 2008

USS3

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USS3

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USB

x

x

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Solid Works

2003

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JG-35FD

17. Fiber optic gyroscope(FOG)

16. Detection area

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(RMSE)

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$$RMSE = \sqrt{\frac{\sum_{i=1}^n e_i^2}{n}}$$

e

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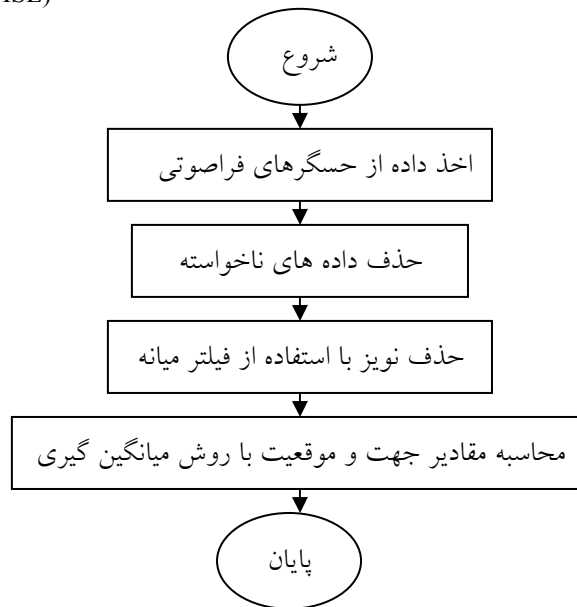
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(Cho & Ki, 1999; Singh et al., 2005)

- 19. Median filter
- 20. Averaging method
- 21. Root Mean Square Error (RMSE)

18. Robotic total station



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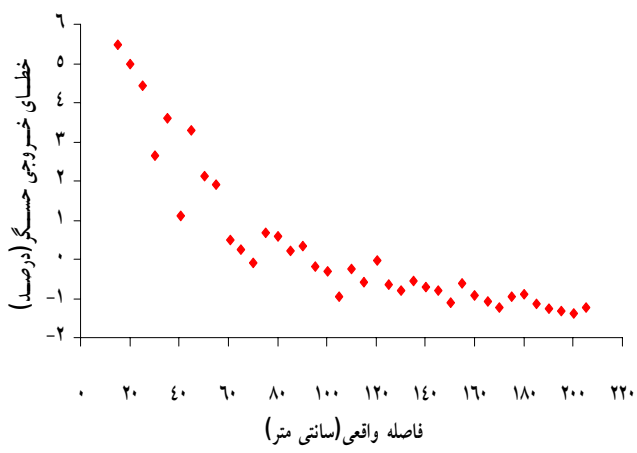
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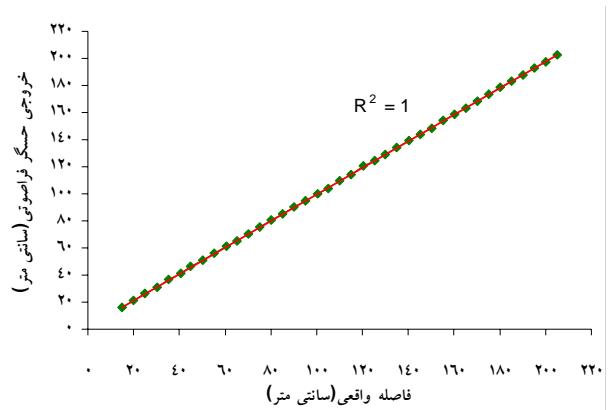


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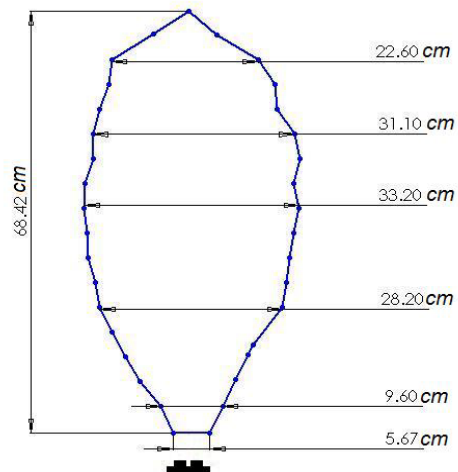
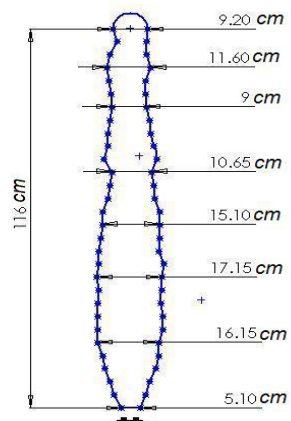
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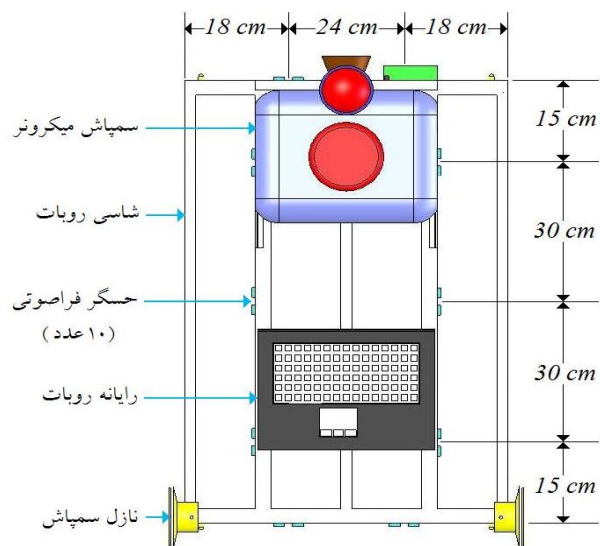
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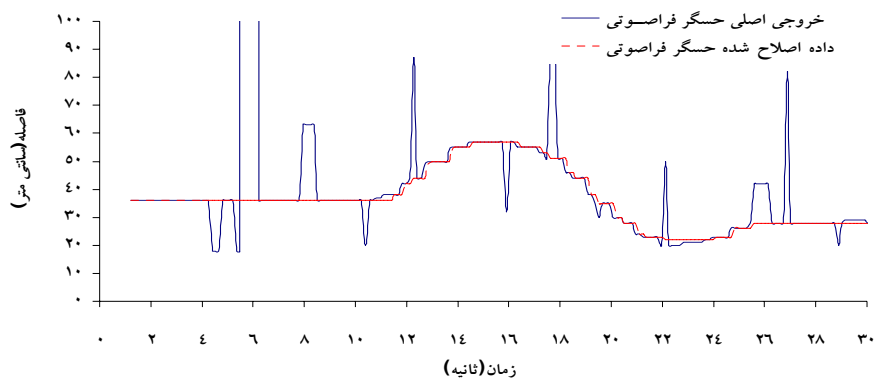
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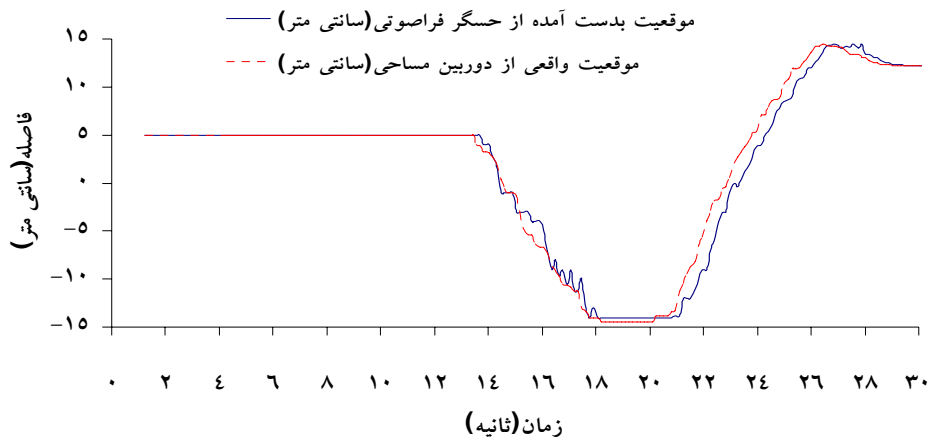
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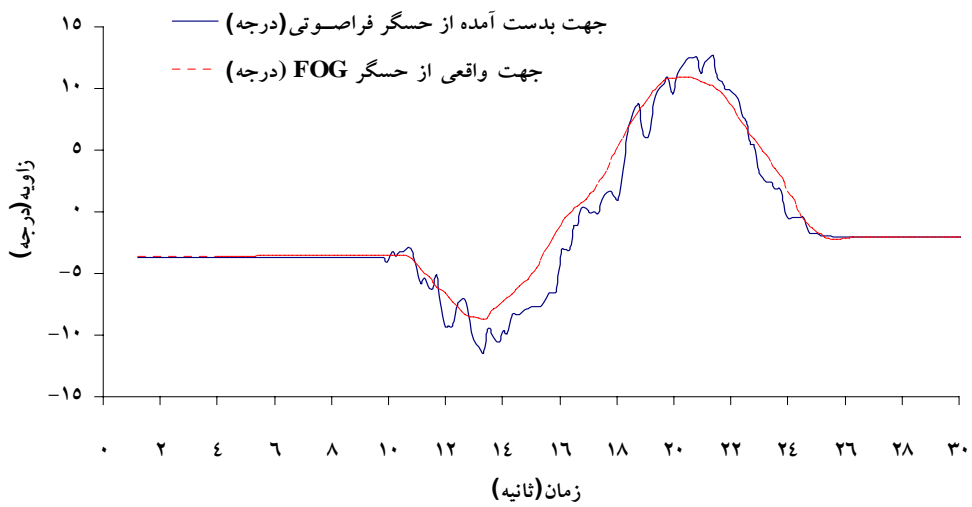
() Singh et al.

RMSE / RMSE
() Singh et al.
/ RMSE



FOG

FOG
RMSE



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(IMU²²

Vehicle Robotics

USS3

cm	e
cm	l
-	n
cm	RMSE
V	V_L
V	V_R
deg	ϕ
deg	θ

22. Inertial Measurement Unit

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