	Extrinsic Calibration of a Lidar classmate Date Page
	Colibeation & boxic requiencent in melti-sensa platforms where data needs to be presented in a common reference frame for the prepose of data analysis and data I fresion.
	Comera provides Entensity information in the form of our Emage Lidas provides depth Enformation in the form of Sel of 30 point clouds.
	Externel Calibration allow reprojection of the 3-0 points from the little coord frame to the 20-coord frame of image. The providure proposed uses checkeboard as Calibration torget.
	Enterise collibration of the Comera Comera Collibration toolken for Martlab -> Bused. Standard in Moitlab toolbon
	Algorithm: Et is ditailed in Moitlab toolbon a. Camera model. foral length -> 2 km Vertor fc. principle point -> Co-ords in 2 x1 Vertor Cc Skow Co-eff -> angle between the x & y
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A Care	En the 3D CO 014 point Observed pinel
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	2/n = Xc/2c = 25
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,	Let, 8= x+y,
3-51	The normalized point after Encluding
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	= (1+ Kc (1) 8+ KC2) 8+ Kc (5) 86)
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a of the	I to year public or into - 1010
let	where of it is the tangential distortion Vertor-
	Veitor- manager 13 months
	2KC(3) XY+KC(4) (8+2x2)
	$dx = \begin{cases} 2KC(3)xy + KC(4)(x^2 + 2x^2) \\ 4x = \begin{cases} 2KC(3)(x^2 + 2x^2) \\ KC(3)(x^2 + 2x^2) \\ 2KC(4)xy \end{cases}$
	KC(3/(8+2)/2/1000)
1020	The structure of the structure of
45	once distorsion & applied, the final Pixel
	coord's of the point are given by:
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	were choosen as X & y and of this frame
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	& the direction I the checkerboord
	be chowsen as the Z-anis
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VI.	- Then the toolbon return the rotation
	Re and translation to of the target
	Re and trouviation Fc. of the target Co-ord. frame.
	in the Colib-Results mat
	in the Colib-Ruilty:mat
	where, i- finden of the observation.
	[\(\lambda \) \(\lambda \)
7	-> This gives the orientation (Oci) and
()	(distant (ac, i) (of the plane
	Oci 1 - Oci = O. which respect the the
4	Camera origin, for each Emager in the
	camera frame of reference
	2 C + 2 () ()) 1 + U 1 10 (2) 10 () 10
	ba Entirula Colebration model
	A cobust total least sauses estimates is used
	to fit a plane to the set of points in 3-D corresponding to the Selection.
	3-D corresponding two the Selection.

	The gives an estimate of Olic & alic in
	the law coold frame
131	First find the translation that minimizer the
	difference in distance from the Camera origins to
1	each plane, represented in the Camera
he	coord: Slow 4 the loser coord figitory.
	End gas.
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	Oc = Oci. Oci2 25- 100 Ocin)
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	as seally from stonget.
	Qu= [al, al,2 - al,n]
	Let I 1 1 = malsin of 3 month 1
10)	where, n-> number of - Scan-Emage, Objectation
	Pougs.
	Subscript, C → Camera, l → lidar.
	l→ lidan.
	(i)
14	Required estimate of translation chos a
	closed form solution given by:
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	ti= (Oc Oc) Oc (de-di)
	Will 1
.) <u>'</u>	Rotation between the reference frame that
	minimizes the difference Ibelivery the normal
	from the Origin to the Corresponding planes
	in the & fearus ? R= Vitt
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	Bingle Value decomposition.
	Single Value decomposition.
	-> The Objective function be be numinized is
ti	Chosen the be the distance from the
	The Objective function be be minimized is chosen the be the distance from the user-selected linear 30 points the the corresponding plane observed from the
4	Coursending plane Observed from the
	Enage,
	a The livery Courted as a business of
	of the least squares.
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	-> The wings at on of the objection function Can
	he done through an êterature optimization
	The uniningation of the objective function Can be done through an êterature optimization provedure with Ential estimate choosen as a result from stage-I.
	as a result from stage-I.
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A.S.	uses from the Eth range image ordered as:
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26-1	where, Ali. ER and m=m(i) is the
	number of linear for 9th loves scan
	Then the problem takes the form:
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	and the second of the second o
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Consuma advisa to the course (4)
The Englementation uses only the points Corresponding the the comers (4) in the rounge Emage.
The stronge intage.
The + 1.0000 has a wided alo with accusant
-> The technique has provided of units accuracy sufficient the met the demands of mobile sobot perception.
eighiet possiption.
S) Class participation