Re: correlation of rotated image with perspective

Source: http://sci.tech−archive.net/Archive/sci.image.processing/2007−07/msg00156.html

- *From*: tsh <tomash.kazmar@xxxxxxxxx>
- *Date*: Tue, 31 Jul 2007 06:19:05 −0700

On Jul 31, 8:16 am, serg271 <serg...@xxxxxxxxx> wrote:

> On Jul 30, 11:36 pm, Adam Chapman
>
> <adam.chap...@xxxxxxxxxxxxxxxxxxxxxxxx> wrote:
>
> > On Jul 30, 9:11 pm, Martin Leese <ple...@xxxxxxxxxxxxxxxxxxxxxxxxx>
> > wrote:
>
> > > Adam Chapman wrote:
>
> > > > Thanks for the reply Bob,
>
> > > > This visual system is designed to go on a
> > > > military UAV in urban
> > > > environments, so anything that lights up will
> > > > likely be shot at!
> > > > I think that a rotated 'H' could be identified
> > > > usin a foruier−mellin
> > > > transform, but it's the distortion from
> > > > perspective thats really
> > > > confusing me.
>
> > > As Bob said, this is a difficult project to
> > > do with image processing. Given this, any
> > > solution you come up with is unlikely to be
> > > robust.
>
> > > You need to simplify the problem. Having a

> laser on the 'H' sounds good to me. You are
> going to need to distinguish your 'H' from
> fake 'H's painted by the enemy anyway, and
> GPS would seem to be appropriate for this.
>
> If the UAV shoots then, presumably, it will
> be fitted with IFF. This can prevent the
> thing shooting at the friendly 'H'.
>
> −−
> Regards,
> Martin Leese
> E−mail: ple...@xxxxxxxxxxxxxxxxxxxxxxxxxx
> Web:http://members.tripod.com/martin_leese/

Thanks for the suggestions.
Ignoring if the 'H' is friendly or not for now, if I could find the corners of the H shape it would be fairly simple to estimate the perspective projection, orientation and distance from the landing pad if the dimesnions of it are known.

I did try finding straight lines with a hough transform, then finding the equations of those lines and identifying corners as the line intersections. However, multiple lines were found on the vertical edges of the H and hence gave me loads of possible corners!

any better ideas?

That is a classical marker registration problem, there are many solutions for it. Specific solution depend on how noisy image, resolution and how much calculating power you can spend. First you can google for "marker registration" "augmented reality" and "mixed reality". BTW there were some threads about it in this ng.
I myself working with cell phone, so I'm well versed only in low−calculation−cost low−resolution methods.
For you situation low−cost method would be to use not pure edge−detector but threshold/adaptive threshold, or combination of threshold−edge−detector. Idea is extract black connected components and analyze them. Make contour from the shape. Segment contour into straight lines (how to do it was discussed in this ng). Now count the number of

> straight lines to see if it the same as in H. If test pass run second
> test −analyze convexity of the contour, it should be the same as in H
> (external lines, internal lines should have the same relationship) .
> Now third test − using statistical projective invariants check all the
> points of the H. After all test passed you can be reasonably sure you
> have identified H. Using corners calculate projective transformation.
> Convert to "H" coordinates and make last test − check that all non−
> corner points have exactly correct coordinate. Now you have your H and
> it's projective transform. The way I described is "cheap" − that is
> what I do on cell phone (I dropped statistical projective invariants
> though − they were not much help in the low resolution image, but if
> your image is high−res they could be extremely helpful).
> If you have unlimited calculation power you can use other
> approaches − for example there exist projective−invariant variation of
> Fourier−Mellin transform (don't ask me about it − never used it and
> even hadn't finished the article).

Hi Adam,

maybe you are interested in blob detection, one method that could fit
is Maximally Stable Extremal Regions (MSER), it is fast, robust, it
can handle projective transformation. The "H" will very likely be
detected
as a single mser. Furthermore there has been some work on mser
tracking which can be usefull for you.

J. Matas, O. Chum, M. Urban and T. Pajdla (2002). "Robust wide
baseline stereo from maximally stable extremum regions". British
Machine Vision Conference: pp 384−393.
http://cmp.felk.cvut.cz/~matas/papers/matas−bmvc02.pdf

M. Donoser, H. Bischof (2006). "Efficient Maximally Stable Extremal
Region (MSER) Tracking". CVPR: pp 553−560
http://www.icg.tu−graz.ac.at/pub/pubobjects/docvpr2006

Regards,
Tomas

.