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Virtual Vision for Emergency Landing based on Autonomous Decision Made by Unmanned Aerial Vehicle

P.Vidhya Devi [1], Dr.B.Mugunthan[2]
[1]Research Scholar, [2] Research Guide Asst Professor
[1]Head, Dept of Computer Science, [2]AJK College of Arts & Science
Karpagam University.

Abstract

Unmanned Aerial Vehicle (UAV) systems love no onboard imperfect pilots; currently enjoin abundant hominid involvement to win thriving work dealing. Further, flourishing dealings also tell extensive cooperation between work stakeholders, including operators, work commanders, and message consumers. Existing UAV method interfaces wage immature to no backing for cooperation between removed operators or for operators to collaborate with information consumers. As certainty on UAVs continues to growth in militaristic and civil operations, this need of supporting for collaboration leave probable beautify a essential regulation of existing UAV systems. In this investigate publisher we select an Image Processing Algorithm using clustering for analyzing the harmless.

Keywords: Virtual Vision for Emergency Landing, Autonomous Decision Made by Unmanned Aerial Vehicle, UAV, Neural networks in UAV.

1. PROBLEM STATEMENT IN MY RESEARCH

The problem addressed by this research is that existing methods for deriving information and functional requirements for human-computer interfaces for operation and control of UAV systems during emergency landing.

The central research hypothesis of this work is that examining two roles of an unmanned Ariel vehicle ie the main task will help to identify information of the safe landig area and second main thing is to identify the parameters of safe landing using the neural networks Artificial intelligence. This Research paper explains the

2. ADVANTAGES OF UAV

A trenchant plus of UAVs is their cost-effectiveness. They can be industrial, produced, and operated at alter costs compared to the outgo of manned aircraft. The qualifying savings in engines, airframes, carbon activity, channelize grooming, logistics, and fixture are large.

The greatest vantage of UAVs, nonetheless, is that there is no risk to hominine lives. Pilotless platforms are the emerging fatal and non-lethal weapons of pick and mortal transformed the way the weaponed forces now engage operations. The measure of losing reconnaissance platforms to foeman onrush is quite higher, thusly making UAV a modify deciding.

UAVs can be classified according to their roles as:

Aerial targets: Used for weapon system evaluation and gunnery practice.

Unmanned Combat Aerial Vehicle (UCAV): for carrying weapon systems. Surveillance/Reconnaissance.

UAVs: For data collection and patrolling/spying.

3. VISION ALGORITHMS

The vision algorithm is described below in three parts; Image preprocessing, geometric invariant extraction, object Recognition and state estimation.

3.1 IMAGE PREPROCESSING

The goal of this stage is to locate and extract the landing target. Figure 3.1 shows an aerial view of the Ariel Aircraft Used in our experiments.

Figure 1: Photo Taken from the Aero Unmanned Aircraft in Coimbatore

Initially the images are converted into grey scale mode using the two group clustering which has been converted as a initial process for identifying the quick zone location for emergency safe land this procedure after implementing in the two group clustering into binary is shown in the figure below Fig 3.2

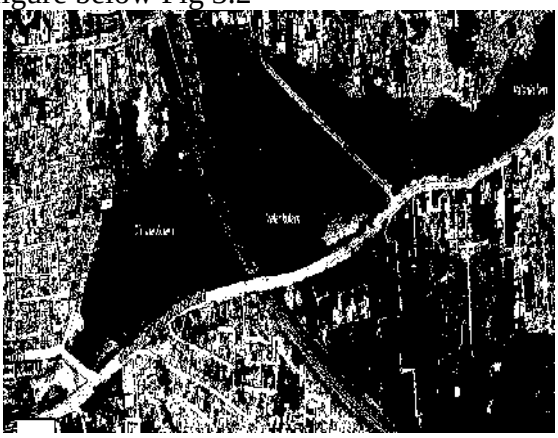

Figure 2: Image converted to grey scale for Overall view of safer major Zones

(a) Thresholding and Filtering. Thresholding converts the color image to a three segmented clustering image using Global K means clustering concentrated tri colored cluster image. The image obtained from the camera is noisy and the frame grabber is of low quality, hence we work with binary images to reduce the computational cost and increase the effectiveness Figure 3:

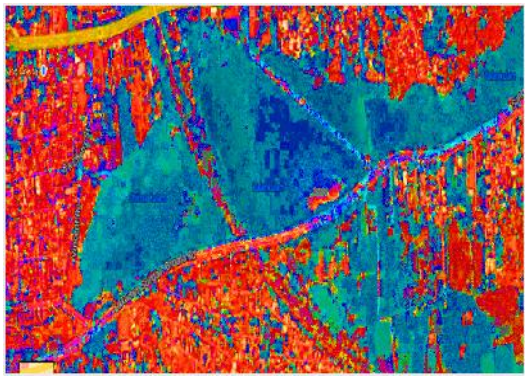

Figure 3: Image converted into an image processing technique for safe landing regions

Image processing results. All the images are taken in-flight from a narrow downward-pointing camera on the helicopter of the algorithm. The image is first converted to gray-scale by eliminating the hue and saturation information while

retaining the luminance. This is accomplished by the following equation where luminance is represented with gamma (Y)

Y = % of R + % of G + % of _ B

Where the indices *i, j* correspond to the coordinate axes *x, y* respectively.

The center of gravity of the Ariel vehicle can be calculated is specified by

$$\bar{x} = \frac{m_{10}}{m_{00}} \qquad \bar{y} = \frac{m_{01}}{m_{00}}$$

Where R,G,B interpret the red, green and Blue values in the person respectively. The thresholding formula moldiness fruit a binary simulacrum which preserves the landing aim but effectively removes most of the remaining information from the appearance. A chesty feat is to limen the appearance at a fixed percent (80%) between the minimum and the maximum organization levels. Personage shows the individual after thresholding. A 7_7 Median filter is practical to the resultant image for removing trouble and to make the furnish information effectively. Median-filters someone low-pass characteristics and they take cumulative designer noise. They agree the sharpness.

(b) Segmentation and Connected Component Labeling.

The image obtained after thresholding and filtering may belong of objects opposite than the helipad. In this measure the various regions of benefit are identified and tagged. The appearance is scanned row statesmanlike until the next component at a edge is hit. All the pixels which belong to the 8neighborhood of the circulating element are scarred as happiness to the underway end. This operation is continued recursively until all pixels belonging to the target are counted. A set of this transmute is the area of the peculiar end in pixels. An goal whose expanse is fewer than a item Sensation (_ 80 pixels) is discarded. Similarly objects whose extent is _ 700 pixels are waste. The remaining objects are our ROI (regions of benefit) and are candidates For the action train.

3.2 INVARIANT MOMENTS

Geometric shapes a crystalline plus of UAVs is their cost-effectiveness. They can be matured, produced, and operated at decrease costs compared to the expenditure of manned aircraft. The individual savings in engines, airframes, furnish usance, airman training, logistics, and reparation are enormous.

The biggest asset of UAVs, notwithstanding, is that there is no venture to frail lives. Unmanned platforms are the emerging fatal and non-lethal weapons of option and hit transformed the way the equipped forces now pursue transaction. The probability of losing intelligence platforms to oppose onslaught is quite higher, thus making UAV a fitter alternative.

. The (p + q)

order moment of an image f(x; y) is given by

$$m_{pq} = \sum_{i} \sum_{j} i^p j^q f(i,j)$$

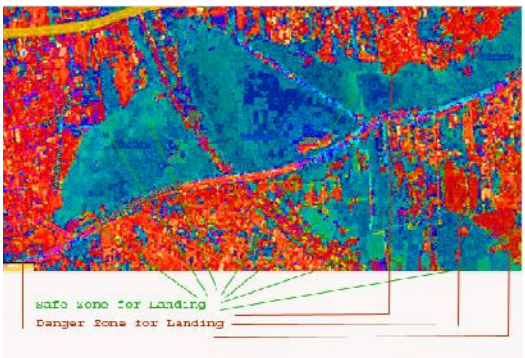

Figure 4: Analyzing safe landing regions and Danger Zone

3.3 OBJECT RECOGNITION AND STATE-ESTIMATION

Initial trials with endeavor information showed that the rest, endorse and gear moments of inertia were ample to severalise between the construction target and different objects presenting the human the formula was mark offline using a set of images composed in antecedent lights. The standardization values stored were the impart values.

of the moments of inertia. During genuine light the moments of inertia of apiece plan are calculated and compared to the standardization values. If they lie within a disposition of 25% of the stored values then the objective is said to be constituted and the formula proceeds to the incoming rank of utter idea in instance of any pilotless Ariel Container.

The state respect algorithm calculates the x-y coordinates and course of the structure butt proportionate to the whirlybird. The passageway is calculated using the x-y coordinates of the landing direct is premeditated using the foresaid Equation. These verbalize estimates are dispatched to the Pilotless Ariel restrain mechanism.

4. CONTROL ARCHITECTURE USING NEURAL NETWORK

A new neural network based controller is introduced and it is controlled using a step by step hieratical behavior-based control architecture. Briefly, a behavior based controller partitions the control problem into a set of loosely coupled behaviors. Each behavior is responsible for a particular task. The behaviors act in parallel to achieve the overall goal. Low-level behaviors are responsible for robot functions requiring quick response while higher-level behaviors meet less time critical needs. The behavior-based control architecture used for the behavior based controller is shown in the below figure

At the smallest story the mechanism has a set of involuntary behaviors that reassert steadiness by retentive the business in hesitate. The header mechanism action attempts to consider the wanted header by using accumulation from the IMU to spark the tail rotor.

The altitude know action uses the sonar to prove the clustered and the enrich. The bitumen and drift discipline

The low-level and short-term content behaviors gyration, motion, direction, elevation and pass skillfulness behaviors are implemented with progressive controllers.

The long-term end activity sailing skillfulness is causative for gross duty preparation and enforcement. If the gallery mistake is microscopic, the guidance skillfulness activeness gives desirable lateral velocities to the pass velocity activeness. If the heading misconception is comprehensive, the aim manipulate action is commanded to array the helicopter with the Content time maintaining zero pass velocity.

The altitude know behavior is far split into three main sub-behaviors, vibrate restrain, velocity interact and sonar test. The waffle control sub-behavior is activated when the Pilotless Ariel Container is either flying to a goal or is hovering over the take. This sub-behavior is misused during the observed values

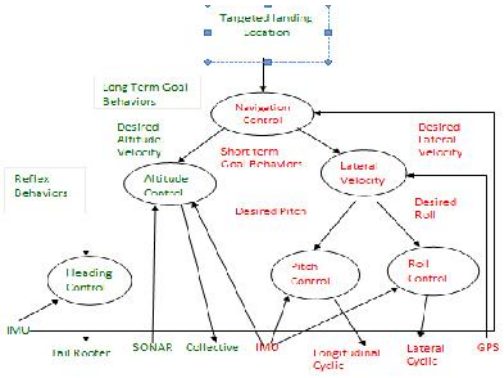

Figure 5: controller architecture using Neural Network Communications

5. CONCLUSIONS AND FUTURE WORK

We have presented the design and implementation of a real-time vision-based system for detecting a landing target and a controller to autonomously land a Aircraft on the target. The vision algorithm is fast, robust and computationally inexpensive. It relies on the assumptions that

a.) the landing target has a well-defined geometric shape using Imaging segmentation.

b.) all the feature points of the landing target are coplanar. Since we chose a landing target composed of polygons and the helicopter keeps the camera roughly perpendicular to the ground, these two assumptions were justified.

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