Electric motor

[Design](#)

The control design of the quadruplet is decided to be different from the common design, giving two propeller power at a given single motion. The control system is powered by a DSSSL microelectronic, the onboard range detectors, gyroscopes and accelerometers provide the look ahead features, making it possible to achieve an autonomous control of the quadruplet. Key words: Quadruplet, JAVA, Complementary filter, Position control, Motor control, Motor drive 1 .

Introduction An aerial vehicle (VA) is considered as a transport medium through the air which are made in different scale factors. The scale is determined according to the application it is used. The Avis which are manufactured in small scales also known as unmanned aerial vehicles (Java), often engage in applications such as military and law enforcement operations, aerial imagery and filming, first responders in unethical environments for search and rescue [3], and research platforms for various fields.

Most of these applications require Java which are capable of hovering in the air, therefore mini scale airplanes do not fall under this category. Therefore multi-copters become more practical in this situation, a multi-copter become advantageous than a standard helicopter, when it is maneuvering the whole unit in the air, being easily controllable due to the available multiple degrees of freedom with multiple independent motors. There are several types of multi copters, Trim-copters, Quadruplets, Hex-copters and ACTA-copters.

A Quadruplet differs from the other types, being simple in aerodynamic design, a simplest yammerer design of the multi-copters, because the design of the other copters require several experiments and proven results of predicted structure symmetry for the optimum flight control. The quadruplet is an aerial vehicle driven by four high speed propeller blades rotated by four high torque motors, [1] known as Brushes DC motors. The well balanced mechanical structure will be responsible for an easy balancing mechanism, and avoided failures due to minimized intensive mechanical vibrations.

The most common quadruplet design keeps a single motor per one direction movement while leaving the two sided motors idling, hush reducing the response time in action. Instead of the common practice, in this project it was managed to keep two motors active, giving a high responsiveness per a single direction movement, at any moment required. Most Java are controlled by a remote controller by a pilot or a computer, on the ground. The others are controlled autonomously. The autonomous control is known as guiding a given object, to a target location or point while minimizing the deviation from the given path [2].

In this scenario, the quadruplet should be controlled keeping its balance according to the reference level momentarily. This autonomous control is done by the control unit onboard the ALAS by estimating movements using the look ahead systems connected. The main sensor feedback system will provide the sufficient data input for this operation on the quadruplet [1]. Using the data input, the quadruplet can be controlled autonomously. The rest of the paper will give a background knowledge on the autonomous control of the quadruplet in section 2, and it will continue to section 3 where the design of the quadruplet is described.

In last section, section 4 will be dedicated to the results of the parametric analysis. 2. Background The accepter is controlled by changing the torques of the each motor independently, thus changing the vector of the applied force [1]. Therefore the quadruplet can be lifted, hovered and landed. Additionally pitch, roll and yaw is achieved with different combinations of the applied force vector [5]. Lifting, hovering, or lowering of the quadruplet is done by applying respectively a higher, equal or lower force than its self-weight.

In this process the four rotating motors supply this force, So two motors, the right front motor (RFC) and left rear motor (LAIR) are rotating clockwise as in Figure 1, while left front tutor (ELF) and right rear motor (OR) are rotating at counter- clockwise direction as in Figure 1, eliminating the torque created by the first two (RFC and LAIR). The three different stages of the maneuvering of the quadruplet, namely Take- off, Hover, Landing; are obtained by changing the applied thrust force (F the) with regard to the exerted weight force (F w) of the quadruplet which is about 1 keg-? 9. 8 N.

The F the is directly proportional to the rotating speeds of the motors. Therefore the applied F the can be changed by 3. Design and Implementation The design of the quadruplet was simplified sing divided sub-systems, which are interconnected with each other and connected to the main controller unit, as in Figure 2. The power supply system will power for the main controller and the other systems, the sensor feedback system will provide inputs according to the configurations, the motor control system actuates the motors, the status output system, will provide information regarding the each change on the system itself.