

# الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ إِنَّ الَّذِينَ تَوَفَّاهُمُ الْمَلَائِكَةُ ظَالِمِي أَنْفُسِهِمْ قَالُوا فِيمَ كُنْتُمْ قَالُوا كُنَّا مُسْتَضْعَفِينَ فِي الْأَرْضِ قَالُوا أَلَمْ تَكُنْ أَرْضُ اللَّهِ وَاسِعَةً فَتُهَاجِرُوا فِيهَا فَأُولَئِكَ مَأْوَاهُمْ جَهَنَّمُ وَسَاءَتْ مَصِيرًا \* إِلَّا الْمُسْتَضْعَفِينَ مِنَ الرِّجَالِ وَالنِّسَاءِ وَالْوِلْدَانَ لَا يَسْتَطِيعُونَ حِيلَةً وَلَا يَهْتَدُونَ سَبِيلًا \* فَأُولَئِكَ عَسَى اللَّهُ أَنْ يَغْفُو عَنْهُمْ وَكَانَ اللَّهُ غَفُورًا \* وَمَنْ يُهَاجِرْ فِي سَبِيلِ اللَّهِ يَجِدْ فِي الْأَرْضِ مُرَاجِمًا كَثِيرًا وَسَعَةً وَمَنْ يَخْرُجْ مِنْ بَيْتِهِ مُهَاجِرًا إِلَى اللَّهِ وَرَسُولِهِ ثُمَّ يُدْرِكْهُ الْمَوْتُ فَقَدْ وَقَعَ أَجْرُهُ عَلَى اللَّهِ وَكَانَ اللَّهُ غَفُورًا رَحِيمًا ﴾

صدق الله العظيم

[النساء: 97 - 100]

## Dedication

*To those who were very  
caring, helping and  
encouraging me for  
advancement and  
success .*

*To my mother and my  
father who supported  
me and believed in my  
capabilities .*

## Acknowledgment

*Thanks to everyone who lead this thesis from the  
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Dr. Fath Elrahman Ismael Khalifa*

## المستخلص

الحوادث الارضية للطائرات لها أثر كبير على خطوط الطيران من حيث التكلفة المادية، سواء كانت تكلفه مباشره مثل تكلفه الصيانة، فقد العائدات المادية للرحلة او غير مباشره مثل فقد الثقة للعملاء، واحد أكبر نسبة للحوادث الأرضية هي الحوادث اثناء سحب الطائرة بنسبه 38% بمجموع خسائر يزيد عن المائة مليون دولار سنويا. في هذا البحث يتم تصميم منظومة لتفادي وقوع هذه الحوادث وذلك عن طريق استخدام المنطق الغامض ومستشعرات لتحديد احتمالية وقوع الحادث ثم تفادي حدوثه، وتنقسم المنظومة إلى قسمين القسم الاول متحكمه على مناطق المحتمل إصابتها بالأضرار مثل الجناح ومقدمة الطائرة بها مستشعرات لتحديد الاجسام القريبة منها وإرسال إشارة إلى القسم الاخر، القسم الثاني متحكمه على الطائرة تعمل على إيقاف الطائرة في حالة احتمالية وقوع الحادث.

وذلك عن طريق استخدام المنطق الغامض في اخراج النسبة المناسبة للضغط حسب عامل المسافة وسرعة الطائرة ودرجة الحرارة الجو، وبعد إجراء الاختبارات على المنظومة تحصلنا على نتائج جيدة في تحديد كمية الضغط المطلوبة لإيقاف الطائرة وتجنب الحوادث الناجمة عن سحبها.

## Abstract

Aircraft ground accident can be quite costly to the airline, with both tangible and intangible costs, it was found that the accident percentage of aircraft towing equal to 38% of all ground damage incidents and it cost more than \$100 million per year in direct cost, this issue will be solve in this thesis by designing system to avoid aircraft accident during towing, using fuzzy expert system with combination of collision detection unit to identify an accident before it happen, The system composed of two main parts, the first part is **outside aircraft Arduino control circuit** which can detect foreign object and react to it immediately by sending a signal to the second part which is **inside aircraft Arduino control circuit** to stop the aircraft.

By using fuzzy logic program to set adequate amount of pressure depend on distance, aircraft speed and ambient temperature.

At the end of research, we have acquired results of output pressure to prevent aircraft accidents during towing with gradations of pressure from minimum to maximum amount of aircraft brake system pressures.

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## List of Abbreviations

AC	Alternating Current
ATC	Air traffic control
AI	artificial intelligence
APU	Auxiliary power unit
CE	Chip Enable
CPU	Central processing unit
CSN	Chip Select Not
DC	Direct Current
DSP	Digital signal processing
F	Fast
FIS	Fuzzy Inference Systems
FL	Fuzzy Logic
H	High
ICSP	In Circuit Serial Programming
IDE	Integrated Development Environment
ISM	Industrial, scientific and medical
IRQ	Interrupt
L	Low
LED	Light Emitting Diode
M	Medium
MISO	Master in Slave Out
MOSI	Master out Slave In
N	Normal
OTP	One Time Programmable
PLC	Programmable logic controller
PWM	Pulse Width Modulation
RAM	Random-access memory
ROM	Read only memory
RTF	Radio telephone
S	Slow
SC	Serial Clock
SPI	Serial Peripheral Interface
UARTs	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Board
VH	Very high
VL	Very low