NEWSLETTER

RETIRED CHARTERED ENGINEERS ASSOCIATION
WORTHING

Hon. Secretary: S. Oliver. Elphin, North Drive, Angmering, BN16 4JJ ☎ 01903 787116

FORTHCOMING EVENTS

28th Oct	Thursday	Coffee - with Partners at Beach Hotel, Worthing
3rd Nov	Wednesday	Coffee - at Albion Inn, 110 Church Road, Hove
9th Nov	Tuesday	**Visit-** National Air Traffic Control Centre, Swanwick 2.30 p.m. see pages 3,8 & 9 for information and application form
18th Nov	Thursday	Coffee - at The Spotted Cow, Angmering
19th Nov	Friday	**Cooch Memorial Lecture** 2.30 p.m. Worthing Library "Shackleton and the great Antarctic rescue" by Dr.M.J. Gilkes
24th Nov	Wednesday	Committee meeting
25th Nov	Thursday	Coffee - with Partners at Beach Hotel, Worthing
1st Dec	Wednesday	Coffee - at Albion Inn, 110 Church Road, Hove
7th Dec	Tuesday	**Talk** - "Railways in West Sussex" by W. Gage, guest 2.30 p.m. Field Place
7th Dec	Monday	Copy date for next Newsletter
16th Dec	Thursday	Coffee - at The Spotted Cow, Angmering
30th Dec	Thursday	Coffee - with Partners at Beach Hotel, Worthing
Every	Monday	Coffee at Laing's Arcade Cafe, Montague Street, Worthing

Coffee mornings commence at 10.30 a.m., except at The Beach, which is from 10.45 a.m.

We welcome the following new member:

1999 **BRYAN-BROWN, D.** M.I.E.E.
16 Thackeray Close, Eastbourne, BN23 7TJ
(01323 461472)
Power electrical engineering. Trained with GEC, Witton, Birmingham. Engineering design - rotating machines. Power semiconductors and rectifiers, design and sales.

Interests: Walking, Cycling, Swimming, Classical music, Choral singing, Preserved railways.

The following members have resigned since the handbook went to print: A.G. Meecham, R.K. Sharma, H. Speight, G. Spencer and J.J. Thomas

48th Annual General Meeting - 7th September 1999

President's Address 1999-2000 INTRODUCTION

As we approach the end of the 20th Century - and the beginning of a new millennium - two developments that were virtually unknown at the start have come to dominate or at least influence the lives of us all.

Superficially these developments would appear to have little in common, but closer inspection reveals that they have a surprising number of similarities.

Each has spawned completely new industries that have either changed the way in which we live or the way in which business in general and individuals in particular conduct their affairs.

Whilst the developments themselves are intrinsically very different, nevertheless conceptually they both offer the individual freedom of one form or another.

At this stage you may be forgiven for wondering "what is this fellow on about?" For during this century there have been enormous developments in any field of endeavour one cares to mention. I might have chosen a number of different developments, but the ones I have chosen I hope will be of interest, for both offers us benefits of one form or another.

I wonder whether what I have said so far has conjured in your minds the same two developments concerned. Yet, with two simple phrases, you will know instantly the two developments I have in mind. With the two phrases "back axle" and "silicon chip" all I hope is now clear. Yes the developments I have in mind are personal transport and the personal computer, the car and the PC. For the former provides us with freedom of movement whilst the later provides us with freedom to do - for want of a better description - intellectual work at our convenience at any time or anywhere.

Judging by the advertisements that one now sees in national and local newspapers and the wide range of different magazines and publications devoted to both the motor car and the PC, it is apparent that the public in general are also interested in these developments.

When comparing such advertisements from a marketing perspective and the copy used, the PC and the motor car have a lot in common.

The presentation carries on to give a brief history of the motor car followed by an in-depth presentation of the history and detail of the Personal Computer (PC). Members requiring to read the complete paper should contact D.M. Lewis.

Meeting place

Given that parking was a trifle difficult at last month's AGM, this prompted some discussion on whether Field Place was still an appropriate location for our meetings. Some members also wondered whether a different day to Tuesday, the present meeting day, might be considered. As a result it was agreed to ask members their views on where they would prefer to meet- bearing in mind the geographic distribution of the membership - and the preferred meeting day. Please complete -as much as you wish – the questionnaire on page 9 and return it as soon as possible.

Dave Lewis

Annual Subscriptions

These are now due. Please send your cheques for £12 to the Hon. Treasurer, D.R. Collard, 9 Meadway, Rustington, Littlehampton, BN16 2DD. If you are not sure whether you have already paid, and to save sending out reminders, please contact the Hon. Treasurer on 01903 785580.

Visit to NATS, **Swanwick,** Southampton**,** on Tuesday, 9th November, 1999 at 2.30 p.m.

Swanwick - The World's most advanced air traffic control centre.

In 1986, National Air Traffic Services Ltd. (NATS) identified the need for a new air traffic control centre. The centre required a new site, new buildings and plant, new electronic systems, new air traffic control procedures and all the necessary logistics to support its operation.

The basic requirement was to provide for UK airspace sectorisation and route restructuring, together with new operating procedures, increased computer assistance and improved capability for communications, training and simulation.

In December 1990, NATS acquired 118 acres of land in Swanwick, Southampton –the site of a disused brickworks.

In June 1997, the Government confirmed NATS future strategy of concentrating on two air traffic control centres. Under this strategy, NATS will concentrate on two new centres. They are the Swanwick Centre, at Southampton, and a new Scottish Centre at Prestwick, Ayreshire.

The objectives of both centres are to :

- maintain and, where possible, enhance existing safety levels
- modernise the air traffic control system
- provide additional en route air traffic control capacity
- be capable of development to meet the needs of the 21st century

When it goes into operational service, the new £350-plus million en route centre at Swanwick is expected to be the largest and most technologically advanced air traffic control centre in the world. It is the largest and most ambitious project ever undertaken by NATS and is vital to the future of one of Britain's most successful industries. What is beyond doubt is that, as the centrepiece of a major capital programme, it represents the UK's biggest single investment in air traffic control ever. The system effectively combines leading-edge technology and techniques with commercial off-the-shelf products. There are 23 subsystems and two million lines of computer code.

All the years of planning are intended to result in a cost-effective ATC centre capable of 40 years of non-stop operation. During that time it is expected to have at least three major system refits.

This visit is **limited to no more than 15 persons** on a first come first served basis. There is no possibility of a reserve list so it is essential that those who apply must be prepared to make the visit. Positive proof of identification is required, eg a UK Driving License will be accepted, as

this may be required before an access pass is issued. Please complete the application form on page 9 and return to S. Oliver.

Cooch Memorial Lecture "Shackleton and the great Antarctic rescue"

by Dr.M.J. Gilkes, guest, at the Worthing Library Lecture Theatre, on Friday, 19th November, 1999 at 2.30 p.m.

Dr. Gilkes was the medical officer to the Salvesen Whaling fleet from 1946 to 1948 and since his retirement in 1987 has returned several times to the Antarctic.

It's official: the Everest craze has helped revive one of the world's oldest extreme sports: "explornography," to borrow a term coined by the New York Times Magazine's John Tierney. One of the most famous explornographers was Sir Ernest Shackleton, who in 1914 set out for the Antarctic with a team of men in search of fame, glory and from the trivialities of everyday life, like heat and toilets. Shackleton and Co. never got to the continent, however. After 10 months on the Endurance, which became trapped and then crushed by ice, the men spent another five months as castaways. Shackleton and a crew of five then made an 800-mile trip to South Georgia Island in a 22-foot open vessel, the James Caird. He eventually led rescuers back to the remaining men, all of whom, miraculously, survived.

After the lecture the R.C.E.A.prize will be presented to Heidi Burgess, who is studying for an M.Eng. at the University of Brighton.

"Railways in West Sussex" talk by W. Gage, guest, at Field Place on 8th December, 1998, at 2.30 p.m.

W. Gage is The Assistant County Archivist at the West Sussex Records Office and is a railway enthusiast, being Hon. Sec. of the Chichester and District Model Engineering Society and constructs live steam model railway locomotives in his spare time. This will be an illustrated talk where most of the material is unpublished.

Don't forget that any **Ladies** interested in the lecture are very **welcome** to attend as guests.

Recordings of Meetings

An audio tape cassette is made of all talks and addresses at each of our General Meetings, thanks to the good services of Eric Roubaud. These tapes are available from the Hon. Sec., but they only go back about two years, as the cassettes are reused.

Fuzzy Logic - talk by K.J. Wheeler, member, at Field Place, Tuesday 5th October, 1999 at 2.30 p.m.

In the seventies and eighties is was apparent to most of us that increasing levels of complexity in engineering systems was matched by increasing unreliability. The digital computer hailed as the saviour has in many cases been unsuccessful. This audience can be described as a group of POST VICTORIAN Engineers where with the help of slide rules and log tables we applied mathematical formula and techniques which were mainly derived in the Victorian era. What we could call the NEW WAVE of engineers are applying new concepts of which FUZZY LOGIC is one. We are concerned here with engineering control systems and how we can use the digital computer to solve the most intractable control problems. The precise definition of complex problems in numerical form translated via a highly reliable digital computer to give a reliable and accurate solution is largely not achievable. However, the approximate definition of

complex problems in linguistic form with a fuzzy logic arrangement feeding a digital computer can in many cases provide the accuracy and reliability required and the purpose of this presentation is to show how this is achieved.
Applications of fuzzy logic include machine control, domestic appliances, automotive systems, artificial intelligence, space and weapon systems. We consider just two possibilities; DC motor speed control and steam engine speed control. The digital computer is complex and very reliable but works on precise numerical data and instructions. In essence it comprises but two elements, a memory which stores data and instructions and a central processing unit which sends data to and from the memory. The digital computer repeatedly cycles the following events:-
1 fetch an instruction from memory. 2 fetch any data required by the instruction from memory. 3 execute the instruction. 4 store the results in memory. 5 go back to step one.
The machine must be told in advance exactly the steps to perform the computer program and the type of data must be in a precise format with each bit stored in a specific location in memory.
Digital computers can only do three things;-
1 move data from one place to another. 2 do arithmetic and comparison operations on data. 3 decide on two or more future operations based on data values(make decisions). In the main control systems are error nulling devices. One puts in the set point (input) and the device monitors the output and determines the error between the output and the set point striving to reduce the error to zero by changing the output, using energy and negative feedback until the output matches the set point. This concept applies to conventional servomechanisms and in most cases to fuzzy logic control systems. A traditional system can be described as solving a linear differential equation using single value (crisp) data in numerical form. A digital control system using direct memory stores numbers sequentially at specific addresses and looks them up, one address at a time. Such a system can use stepping motors in an open loop mode. A fuzzy system has a memory which works in parallel and partially and by using a digital computer it searches and fires the whole memory at the same time. A fuzzy system replaces numbers with linguistic statements. Expert systems use the three things a digital computer can do arranged as a knowledge base which contains IF-THEN rules,a data base which contains relevant facts and an inference engine which applies the rules to the data bases facts and tries to reach an acceptable result. A difficulty experienced with conventional expert systems is writing a sufficient number of rules. The mathematical model applied by engineers to describe any system states that cause which is a function of variables a,b,c,etc. equals effect and the connections between a,b,c,etc. may be unknown. We know from our experience when witnessing an effect the action to be taken to mitigate that effect and this action we best state in words. For a system at a particular time,IF x **THEN** y. For example, **IF** the room is too hot **THEN** turn the heat down. **IF** the temperature is about right **THEN** do nothing. In a control system with negative feedback,**IF** the effect deviates from what is required **THEN** take the appropriate action and compare the result with what is required. Fuzzy systems replace the precise numerical data used in conventional digital systems with imprecise statements in words. This suits us well for it is far easier to say “slow down a bit” rather than “decelerate at 2 metres a second over the next 10 metres” and then express this latter statement in numerical form. Any non-linear function can be covered by what are known as IF-THEN rule patches and this forms part of the Fuzzy Approximation Theorem. Like most theorems,one does not have to fully understand the principles involved but only the methodology used in implementing it. In this synopsis it is best demonstrated by the example involving DC motor speed control later.The FUZZY ASSOCIATIVE MEMORY is the heart of the fuzzy system. Fuzzy systems collect the values (rule patches) together as linguistic statements and fires them partially and in parallel at the same time. The weighted value of the outputs expressed as areas of the residual triangles are summed and an overall centroid determined; this centroid value is the crisp output value at that instant as part of an iterative process where the feedback mechanism strives to achieve with the set point.

The DC motor speed control system (DIAGRAM 33) requires no knowledge of fuzzy sets or the fuzzy approximation theorem. Indeed such problems can be solved by A-level students and often are using a old PC and the ability to program in Quick Basic.The rule patches (DIAGRAMS 32 and 34) show that a set point of 2420 RPM requires 2.4 volts applied to the motor.With a deviation in speed to 2437.4 RPM results in a degree of membership of 0.4 and 0.3 in the "about right" and "too fast" input sets respectively with complementary reductions to the output sets such that the centroid of the two output sets is determined by the computer to be 2.375 volts resulting in a slow down of the motor shaft with new valuations occurring continuously as the shaft speed returns to its set point of 2420 RPM.With the fuzzy logic control system at no time has a mathematical model with numerical equations been used; only linguistic statements of approximation. This justifies the claim that knowledge of the under-lying cause is not required for action to be taken against the witnessed effect. This is quite distinct from conventional systems where the under-lying mathematical model must first be determined. In summary this presentation related to the use of fuzzy logic in engineering control systems. Such systems can solve in many cases the most intractable non-linear problems where the relationships relating to the causes are not known or are too difficult to determine. It uses IF-THEN rules expressed in words describing the action to be taken for the observed effect, firing all the rules to some degree at the same time, summing the result and taking the weighted average of this result to produce an output value repeating this process thousands of times a second as the error of the output reduces with respect to the set point by the use of negative feedback.
FOOTNOTE-The comprehensive paper rather than this limited synopsis complete with diagrams can be made available to those members who are interested.

Ken Wheeler

Diagrams

List of members

Map to swanwick

Questionnaire

Please return to D.M. Lewis, 8 Arlington Avenue, Goring by Sea, Worthing, BN12 4TA

Venue Options / Requirements	Field Place	Durrington	English Martyr's Goring	Any other venue
Seating capacity of the room				
Facilities: tea making, O/H projector etc				
Parking – on site or off street				
Access from public transport				
Availability for hire				
Public Address system				
Preferred Meeting day				
If known likely cost of hire				

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To: S. Oliver, "Elphin" North Drive, Angmering, Littlehampton, BN16 4JJ Tel: 01903 787116

I wish to participate in the visit to **NATS, Swanwick** on Tuesday, 9th November 1999 at 2.30 p.m.

Full Name .....(Block capitals)

Address .....

.....

Phone No.....

Vehicle Registration……..

Car sharing I can offer.....seats from..…….....I would like a lift from.....

S. Oliver
"Elphin" North Drive
Angmering
Littlehampton

Applications by 26th October, 1999

BN16 4JJ