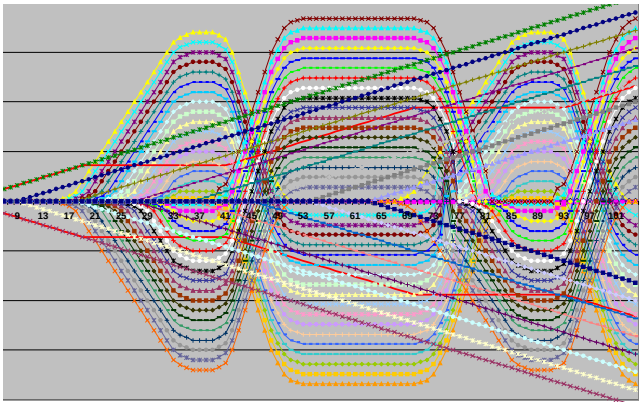
Brussels, China and Fuzzy Logic
Pattern Matching

We went all the way to Brussels a few weeks ago to talk about our new fuzzy logic product moment pattern matching engine at a conference held by Computer Sciences Corporation (CSC) entitled "Extreme Data". Nobody nearer to home would listen.

The audience told us they had nothing similar in their home countries, but we are sure they were just being kind.



When systems receive data in a variety of formats – radians, linear, voltmetric etc. – we need a pattern matching engine that simply doesn't care. It reads the data, understands it and tells us what it means, agnostic of the data units.

Even better, when it doesn't understand it, it lets us know.

We have built a library of characteristic signatures representative of subsidence, heave, escape of water, poor ground - yes, even stability! Our engine looks at the data in the same was as you or I would, and then makes a probability assessment which runs behind a rules engine.

The difference is, it does this all day and all night, without an HR department in sight. No holidays and no sick leave. Sorry, but that's the way it is. We could have outsourced it to China, but we wanted it fast and cheap.

The best is, it is dimensionless. Just imagine that. It matches patterns, not absolute values. We love it as you may have gathered.

It doesn't have a British Standard or a Code of Practice by the way. It's fuelled by common sense. See example of use on Page 4.

Help Needed

Funding is urgently needed to purchase the following items. Can anyone help?

A Weather Station to be installed at Aldenham School (see following page) and then left in place to form a long range forecasting site allowing us to gather and distribute data to our members and insurers.

We will donate this to the school in exchange for collecting data going forward and we hope it will eventually provide an 'early warning' signal of event years. It also ties in with the climate modelling being carried out by Prof. Powrie's team.

The output can be used to model SMD values.

The cost of this is just under £1,500 and the supplier is Tempcon who are based just south of Arundel. The station measures temperature, humidity, wind direction, wind speed and rainfall.

Moisture Sensors to be validated on the research site and the output compared with ERT, precise levels and traditional testing.

Again, our hope is these will be left in site to give a profile of moisture movement in North West London and eventually we will have some extremely valuable information that will help us better understand climate change. This aspect is also part of the telemetry/TDR project.

Funding required for this will be in the order of £2,500.

How does it work? Anyone providing sponsorship is invoiced directly by the supplier. The equipment is delivered and installed on site at Aldenham.

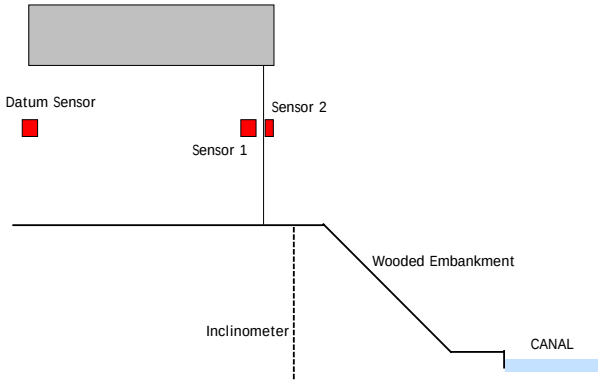
If you are able to help or want any information, please E-mail ael@blueyonder.co.uk, or go to our website at www.theclayresearchgroup.org.

Giles Biddle

Our thanks to Giles who has offered two neutron probes to the project to assist in the measure of moisture change at the research site, and calibration of other sensors. Southampton are considering this at the moment – a very generous gesture by Giles.

An Example

Not all of our work is being carried out at Aldenham. We have a variety of claims that are forming part of our research, and the illustration below shows the value of remote monitoring.



There is a question mark over the cause of movement to this two storey structure which has been built very close to a steep slope in the Mercia Mudstone.

The slope is heavily wooded and the roots act in two beneficial ways. First, they reduce the porewater pressures, making the soils drier and thus less likely to slip. Second, they have a tensile strength in their own right. They form an effective matting below ground to hold the soil together.

We have installed 3 electrolevels to detect any movement in the building and we are monitoring the embankment with an inclinometer.

The electrolevels are viewable on the web site and we have taken an initial reading from the inclinometer. If the tilt sensors detect any form of movement, we will take a second reading from the inclinometer and this way we can determine if the embankment is the cause of the problem prior to taking remedial action.

Clearly this is an exceptional situation and because of its background it has some legal issues in respect of a recovery action which makes gathering objective evidence at frequent intervals essential.

Prof. Powrie and his Team

We had a briefing session at Southampton University last week and met Dr's. Derek Coles and Joel Smethurst who are joining the team.

Our project is being extended to include climate modelling. This team already have a wealth of data from their work at the Newbury Bypass, but Aldenham offers a unique opportunity.

It is situated in North London, in Tile 161 of the Meteorological grid. We hope to install early warning station and we will donate the weather station to the school in exchange for data going forward, from a reliable source in an excellent location.

We may need a little financial help here (see front page) and the covering E-mail may contain the usual begging paragraph, but we have it on order, and hopefully the cash will follow.

Long term we hope to be able to model event years and try and get a feel for trends. Rather than rely on others, we can do it ourselves.

Whoever funds it gets front-page recognition. Unless they want to stay anonymous of course! Perfectly understandable if they do.

It's personal. These views belong to Eddy alone. We didn't want to print them. Nobody agrees with them. They aren't representative of the CRG's views, or any of its members. No, seriously.

What's the Point of Change?

"Good question and maybe we should ask the corner shopkeeper. He may have some useful tips.

We need to deliver good quality data, faster, cheaper and with the minimum of fuss. Surely this makes sense?

If we can monitor building and moisture movement cheaply, accurately and from our desk, why aren't we doing it?

In the Press

Robinson et al have published a paper entitled "Evaluation of a Capacitance Probe Frequency Response Model Accounting for Bulk Electrical Conductivity" in which they compare the TDR and Network Analyser Measurements.

Gratifyingly they came down in favour of the TDR moisture probe, saying "the TDR measurements were much more consistent, producing apparent relatively permittivity values below those of the Topp curve for the finer textured soils."

Logsdon (2005) tells us that TDR is commonly used to determine water content and that many laboratories have shown accurate water determination across a wide range of soils.

Heimovaara et al ("Obtaining Spatial Distribution of Water Content along a TDR probe using SCEM-UA Bayesian Inverse Modelling Scheme") says that "Time Domain Reflectometry has become one of the standard methods for the measurement of temporal and spatial distribution of water in soils".

All papers appear in The Soil Sciences of America Journal, 2005.

The advent of the TDR is timely. Our partners in the CRG are adapting the sensors to fit with our electrolevels so that we can receive both signals wirelessly. The next step is correlating moistures and tilt.

Aston University Conference

Our thanks to Gary Strong who arranged for this advert to be placed in The Post, and to the individual sponsors who are contributing towards its cost.

Speakers include Malcolm Cooper, a leading underwriter with a major insurer and representatives from all of the major adjusters. We have some interesting – and not too technical – viewpoints from Dr Nigel Cassidy (Keele University) and Tim Freeman and Hilary Skinner will provide an overview of the work of The Clay Research Group.

Stands have been taken by Monitoring Services who will be showing off their black box monitoring devices, Roger Bullivant, GAB and InFront Solutions.

By the way, don't forget we have a surprise guest speaker. It will be a good day.

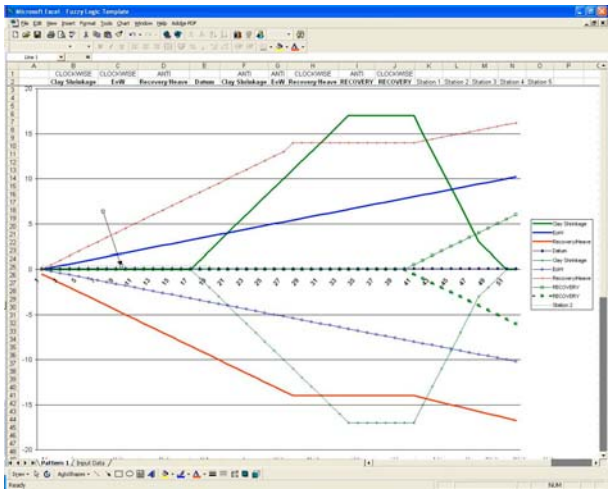
Do come along. 15th June 2006. Tickets from Helen Mallison at Aston on 0121.204.3593.

An Example of Pattern Matching

One of our members receives a lot of data from the electrolevels, and we thought we would put the pattern matching application to the test by inserting some of the oddest of their results.

Bingo. Hole in one. Call it what you will. 'Hitting the nail on the head' springs to mind.

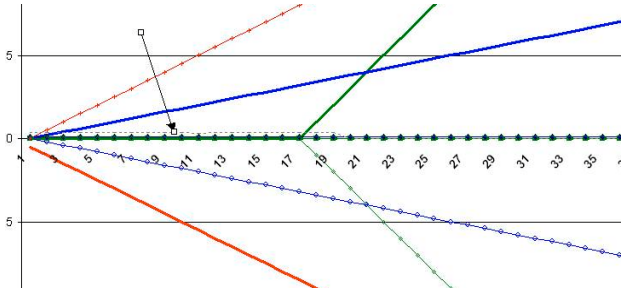
From the smallest trace of data, the tichy grey line shown by the black arrow – you can't even see the trace at this scale - the application determined the results pointed to heave. It gave us a handle on when the tree was felled.



Nervous to report these in any published format, Eddy phoned the 'other party' to make some general enquiries first. He probed "does it involve a tree that is no longer" he asked, ponderously just in case it was too far adrift. "If so, was the tree felled in the middle of February""

Silence at the other end. "I'm just thumbing through the file" was the lame reply.

Of course the application had got it right. Why wouldn't it? It only deals in fact. It doesn't have an opinion, thank goodness. It can't use the "in my considerable experience" punch line to answer a question it isn't sure about.



Network Rail

Embankments are a major problem for Network Rail. They have recruited Professor Powrie's team to instrument and monitor some of the slopes adjoining their tracks, and they are using similar technology to that employed at our site at Aldenham.

TDR moisture sensors, a weather station and a spinkle of climate modelling. There is a very real need for a better understanding of what happens to clay soil when it dries and the implications for us going forward.

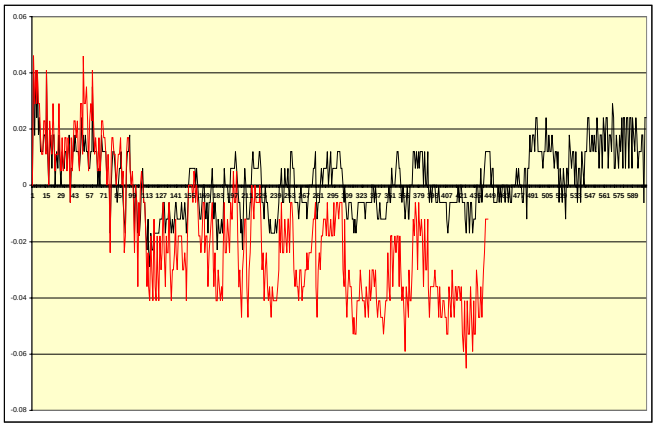
We will be seeing surge years more frequently to the point where, if Southampton's projections are correct, they will become an every day occurrence in the summer.

Telemetry

Electrolevels and soil sensors gather an enormous amount of data over a short period of time. The graph below gives you some idea. More interestingly, look at the 'y' scale. These data are in the range –0.06 to + 0.04. Tiny angular movements.

Our research has been useful in determining when they become significant, and when they are recording background noise. Things like temperature fluctuations, vibration and any suggestion of drift.

We do this by (a) subjecting the sensors to rotation in the laboratory and (b) complementing them with precise levels.



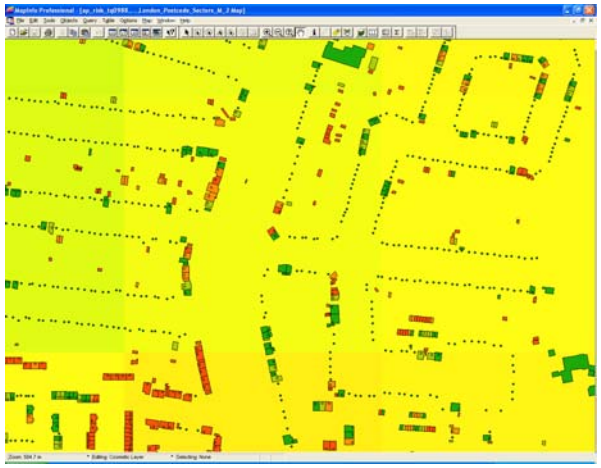
There will never be complete agreement because of the way masonry flexes but we do measure movement.

The benefits are, we can produce evidence much quicker than before. We no longer have to wait 3 months between readings, or keep Mrs Bloggs waiting for our visit. Lots of good things.

A Detailed View of the Subsidence World

With kind permission from Addressology we can publish the following images showing extracts from their work in accurately plotting potential risk for insurers, and to help build triage applications for adjusters.

At high level (above), we see the tiled grid of our own geology built from actual investigations and claims data on a 250m tiled grid. Below we can see the relative risk, which is modelled using the upper boundary condition. The model is then dynamically resized 'on the fly' to take account of the real world.



In this example, we have removed the building outline for the zero risks, leaving the outline of anything with root zone incursion. The very high risks appear as a red building outline (bottom left of the screen). The large majority of the properties are classified as very low risk.

Addressology will be speaking at the Aston Conference if anyone is interested in seeing a live demonstration.

Time Domain Reflectometry (TDR)

Soil testing is a sore point. We don't like most of the tests, as you will have already gathered.

Much more meaningful to gather data over a period of time, and measure whether the soil is wetting or drying, and if it is drying, is it happening in an area close to the tree, and in the vicinity of damage?

Why excavate soils, carry them off to the laboratory and then carry out some rather strange tests? Or is this just because it is the way we have always done it?

Trying to establish absolute values is nonsense, whatever anyone tells you.

Dielectric moisture sensors are accurate, simple to install and don't involve sampling at all. What is more, they measure movement over a period of time, wirelessly. Data is sent over the web to a desk top viewer.

See how the ground is behaving from your office. Why not? See Page 3.

Hopeless Engineers

Lack of innovation. Tied to Codes of Practice. Unable to think out of the box. Making too many mistakes. Instead of thinking for themselves, engineers refer to codes. It absolves them from responsibility.

A blind man can see the sense of much of the innovation, but not the trusted engineer. No.

He refers to the British Standard first, and doesn't get to the stage of thinking for himself. He sits at his desk 'waiting for the published accreditation" before he can see the sense of it and the trouble is, he doesn't read any journals so life doesn't change.

Look for the chap using moisture comparisons with the Plasticity Indices to assess desiccation. It's him.

We are told most good engineers are acting as expert witnesses in cases involving poor engineers.

So, whose view are we reflecting here? No, not Eddy's. Prof John Atkinson from City University no less, with support from Prof. Peter Vaughan. It must be bad. It is. Poor isn't the word.