

Notes for PowerPoint presentation 'Fortran@59H.pptx'

SLIDE 6

Sayings from cards distributed on Pioneer Day June 9 1982

FORTRAN is a collection of Warts held together by bits of Syntax. - Anon.

The one central attribute of FORTRAN is its name - Martin Greenfield

FORTRAN - "the infantile disorder" - is hopelessly inadequate for whatever computer application you have in mind today too clumsy, too risky and too expensive. - Edsger Dijkstra

God is Real (unless otherwise declared in an explicit type statement or in an implicit declaration) - B. Graham

I don't know what the language of the year 2000 will look like but I know it will be called FORTRAN - Tony Hoare

FORTRAN is a language to avoid - unless you want some answers - Anon.

In the good old days, physicists repeated each other's experiments just to be sure. Today they stick to FORTRAN so they can share each other's programs, bugs included. - Edsger Dijkstra

SLIDE 8

The creation of Fortran: in their own words

Run video in web browser using <https://www.youtube.com/watch?v=Bwj9LoxyJ9E>

SLIDE 14

Report presented to WG5 meeting in Las Vegas, June 2014

Gfortran is part of the open source GNU Compiler Collection and is free to download and install on a wide range of platforms.

See <http://isotc.iso.org/livelink/livelink?func=ll&objId=16737474&objAction=Open> for full presentation.

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Some current application areas for Fortran

Weather forecasting and climate prediction - see www.fortran.bcs.org/2007/jubileeprog.php

Analysis of seismic data for oil and gas exploration

Nuclear test ban verification - see www.fortran.bcs.org/2007/jubileeprog.php

Modelling of nuclear weapons - see www.fortran.bcs.org/2007/jubileeprog.php

Earthquake Engineering – see www.bris.ac.uk/earthquakelab

Financial analysis

Vehicle crash simulation

Analysis of data from space probes and satellites

Computational fluid dynamics (CFD)

Mathematical modelling of materials and processes

Computerised aircraft performance monitoring

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Supercomputing in the USA, 2010

Run video in web browser using <http://www.youtube.com/watch?v=TGSRvV9u32M>

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The Met Office climate model HadSM3 and climateprediction.net

See <http://www.fortran.bcs.org/2007/jubileeprog.php> for the presentation by Michael Saunby, Met Office's Hadley Centre for Climate Change

<http://www.climateprediction.net/>

Welcome to the world's largest climate modelling experiment

Climateprediction.net is a volunteer computing, climate modelling project.

We run climate models on people's home computers to help answer questions about how climate change is affecting our world, now and in the future – Sign up now and help us predict the climate.

Evidence of how our climate is changing is vital to encourage investment in reducing greenhouse gas emissions, as well as coping with inevitable change.

You can help discover how the climate could look by running our free software on your computer. The data generated is sent back to us and incorporated into the climateprediction.net projects.

Our computer models simulate the climate for the next century, producing predictions of temperature, rainfall and the probability of extreme weather events. The more models that are run, the more evidence we gather on climate change.

Get started and help us predict the climate.

March 2016

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Discussion Points

Have these changes already begun?

The North Atlantic jet stream wind speeds reached 250 mph on 8-12 January 2015
An eastbound JFK-LHR crossing took only 5 h 16 min, which is the current non-Concorde record

Westbound LHR-JFK crossings took so long that two flights had to make unscheduled refuelling stops in Maine

Extrapolation to all transatlantic traffic (600 crossings per day) suggests that aircraft will collectively be:

airborne for an extra 2,000 hours each year

burning an extra 7.2 million gallons of jet fuel at a cost of \$22 million

emitting an extra 70 million kg of CO₂ into the atmosphere, equating to 7,100 British homes

Williams 2016

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Summary

A basket of 21 CAT measures diagnosed from climate simulations is significantly modified if the CO₂ is doubled

At cruise altitudes within 50-75°N and 10-60°W in winter, most measures show a 10-40% increase in the average CAT strength and a 40-170% increase in the volume of airspace containing moderate CAT

We conclude that climate change will lead to bumpier transatlantic flights by the middle of this century

Flight paths may become more convoluted to avoid stronger and more frequent patches of turbulence, in which case journey times will lengthen and jet fuel consumption will increase

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Forensic Seismology for Nuclear Test Ban Verification (1)

Early 2000s - Some Practical Applications of Forensic Seismology - see

<http://web.mst.edu/~rogersda/umrcourses/ge342/Forensic%20Seismology-revised.pdf>

This reference is the source of these 8 slides

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More information on Forensic Seismology and Nuclear Test Ban Verification

September 1998 - Forensic Seismology Supports the Comprehensive Test Ban Treaty - see <https://str.llnl.gov/str/Zucca.html>

January 2007 - Contributions by T.L. van Raalte and John Young to "Fifty Years of Fortran" meeting - see www.fortran.bcs.org/2007/jubilee/contributions.php

These contributions are from AWE Blacknest, the UK test ban verification centre

November 2011 - Supercomputers offer tools for nuclear testing - and solving nuclear mysteries - see www.washingtonpost.com/national/national-security/supercomputers-offer-tools-for-nuclear-testing--and-solving-nuclear-mysteries/2011/10/03/gIQAjnnqdM_story.html?wpisrc=nl_tech

SLIDE 52
TAX QUOTATION

The only difference between a tax man and a taxidermist is that the taxidermist leaves the skin - Mark Twain

SLIDE 56
Vehicle crash simulation

Run video in web browser using
<https://upload.wikimedia.org/wikipedia/commons/0/01/Traffic-accidents-pmed.1000250.s002.ogv>

SLIDE 57
Harvard Lomax

Computational fluid dynamics - "The Numerical Wind Tunnel",
See 14th AIAA Computational Fluid Dynamics Conference June 28-July 1999 – "Harvard Lomax: 1922-1999" at http://people.nas.nasa.gov/~pulliam/mypapers/lomax_la.ps

SLIDE 61
The CASTEP project: Materials Modelling by Quantum Mechanics

CASTEP is a materials modelling code based on quantum mechanical density functional theory, used for the simulation from first principles of systems varying from surface structure of catalysts, magnetic nanoparticles to NMR and optical spectroscopy of solids.

Goals of the CASTEP project

Full-featured materials modelling code based on plane-wave basis and pseudopotentials

- A comprehensive set of "properties" calculations such as spectroscopy
- Engineered for extensibility as development platform
- Robust in use; good I/O interface and error reporting
- Portable to wide range of platforms and compilers
- Parallel HPC code targeted at cluster and supercomputer services

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CASTOR HPC Capability

The CASTEP project has been a great success
Synergy of Fortran and Physics can be very productive
Fortran is the dominant language in a very high-impact field of science -
computational materials modelling

SLIDE 63
HyperSizer and Virgin Atlantic GlobalFlyer

See <https://en.wikipedia.org/wiki/HyperSizer> and
https://en.wikipedia.org/wiki/Virgin_Atlantic_GlobalFlyer

SLIDE 64

Boundary Element Package for Current Distribution Modelling in Electroforming

2D Boundary element program for current distribution modelling in electrodeposition was developed in the early 1980s in the Department of Electrical Engineering at the University of Sheffield.

A copy of the source code, written in FORTRAN 77, was purchased by my employers in 1986 and modified to accept input from our inhouse CAD/CAM system and to run on a range of hardware from DEC VAX to desktop PCs with output to plotters, graphics terminals and PC screens.

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FASTEST BLADES IN THE WORLD

Last August a modified Westland Lynx broke the world speed record by a handsome margin. A speed of just over 216kt was reached, which meant that the advancing tips of its composite blades were near-sonic at Mach 0.97.

FLIGHT INTERNATIONAL 27 December 1986

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Fortran SCAP for iOS by [DynamicSource AB](#)

Fokker Services and DynamicSource AB have jointly developed an iOS Application to run FORTRAN Take-Off and Landing SCAP (Standard Computerised Airplane Performance) modules on the Apple iPad®. The app allows an operator to make the performance calculations shortly before take-off and therefore allows the opportunity to incorporate last minute changes with respect to aircraft loading and runway conditions.

OEM take-off and landing performance calculation modules are complying with the IATA SCAP interface specification. They are written in Fortran. Normally Fortran programs do not run on iPad®, but the software engineers from DynamicSource AB managed to make this possible.

The OEM-supplied SCAP module is combined with a calling program and an airport/obstacle database. Via a user-friendly Graphical User Interface (GUI) relevant data like aircraft-weight, wind, and runway condition are fed into the app. Within seconds the take-off and landing data like V1, V2 and flap setting are presented on the screen of the iPad®.

May 2013

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If you want to know more

FSG website - www.fortran.bcs.org/2007/jubileeprog.php

WG5 document archive - www.nag.co.uk/sc22wg5/index.html

J3 document archive - www.j3-fortran.org/

Fortran and Fortran II history, including 1982 IBM film describing the development of the first Fortran compiler - www.softwarepreservation.org/projects/FORTRAN/