# Flex expert system

Flex is a hybrid expert system toolkit developed by [LPA](http://en.wikipedia.org/wiki/Logic_Programming_Associates) which incorporates [frame-based](http://en.wikipedia.org/wiki/Frame_language) reasoning with inheritance, [rule-based programming](http://en.wikipedia.org/wiki/Rule-based_programming) and data-driven procedures.

Flex supports both forwards and backward chaining, and they can be interleaved.

Flex provides its own English-like Knowledge Specification Language, KSL, which helps ensure that knowledge-bases are readable by domain experts. Flex KSL can now be generated automatically for certain classes of problems from [VisiRule](http://en.wikipedia.org/wiki/VisiRule).

Flex is implemented in, and has access to, [Prolog](http://en.wikipedia.org/wiki/Prolog). As opposed to most expert system shells, which tend to be constrained, Flex is an open toolkit.

Flex has proved very popular in education and was licensed to the Open University as part of T396: 'Artificial intelligence for technology'.

Much of the material for this course is described by Prof Adrian Hopgood in his book: Intelligent Systems for Engineers and Scientists, Third Edition, and on his web-site.[[1]](http://en.wikipedia.org/wiki/Flex_expert_system#cite_note-AI_Toolkit-1)

There is also a Flex tutorial on the LPA web-site.[[2]](http://en.wikipedia.org/wiki/Flex_expert_system#cite_note-Flex_Tutorial-2)

Flex has been used to power AllerGenius, an expert system specifically developed by leading allergologists to help interpret the results of modern in vitro allergy tests such as the ImmunoCAP ISAC. These tests can typically measure specific antibodies to more than 100 allergen components from more than 50 pre-selected allergen sources and require a lot of expert interpretation. [[3]](http://en.wikipedia.org/wiki/Flex_expert_system#cite_note-Allergenius-3)

## External links

* ["Introduction to Flex/KSL (Part I)", James Mathhews, Generation5](http://www.generation5.org/content/2001/prg04.asp)
* [Flex Technical Details](http://www.lpa.co.uk/flx_det.htm), LPA
* [WebFlex demos](http://www.lpa.co.uk/wfs_dem.htm), LPA
* [Flex Training](http://www.intbis.com/intbis_pages/train.php), IbIS
* ["A flex-based expert system for sewage treatment works support", Dixon et al, PCAI Magazine](http://dl.acm.org/citation.cfm?id=297981)
* [ESSE: An Expert System for Software Evaluation](http://www.lamsade.dauphine.fr/%7Etsoukias/papers/esse.pdf)
* ["Fuzzy Fault Tree Representation and Maintenance based on Frames and Constraint Technologies: A Case Study", Dokas, Nordlander and Wallace](http://4c.ucc.ie/web/upload/publications/inProc/KCCP-2007%20Dokas-Nordlander-Wallace.pdf)
* [“A Knowledge-Based System for Spinning Management”](https://repositorium.sdum.uminho.pt/bitstream/1822/8868/1/A%20Knowledge-Based%20System%20for%20Spinning%20Management.pdf)
* [A NOVEL APPROACH FOR EXPERT SYSTEM AIDED DATACENTER DESIGN](http://iraj.in/up_proc/pdf/86-140412387293-96.pdf)
* [“An Expert System using A Decision Logic Charting Approach for Indian Legal Domain With specific reference to Transfer of Property Act”](http://www.cscjournals.org/csc/manuscript/Journals/IJAE/volume1/Issue2/IJAE-10.pdf), N B Bilgi, Dr. R V Kulkarni & C. Spenser
* [“An expert system for Seismic data interpretation using visual and analytical tools”](http://www.ijser.org/researchpaper%5CAN-EXPERT-SYSTEM-FOR-SEISMIC-DATA-INTERPRETATION.pdf), Neelu Jyothi Ahuja and Parag Diwan
* [“An expert system machinability data bank”](http://pubcouncil.kuniv.edu.kw/jer/files/19Nov2012102247An%20expert%20system%20machinability%20data%20bank%20%28ESMDB%29%20approach..pdf)
* [“Development of an Ontology-Based Portal for Digital Archive Services”](http://www.iis.sinica.edu.tw/APEC02/Program/chingyeh.pdf), Ching-Long Yeh
* [“A development process meta-model for Web based expert systems: the Web engineering point of view”](http://orbit.dtu.dk/fedora/objects/orbit:88354/datastreams/file_7703263/content), Ioannis M. Dokas and Alexandre Alapetite
* [“Behavioural issues in Information Systems Design”](http://www.pacis-net.org/file/1997/75.pdf), Mike McGrath
* [“Artificial Intelligence Approach to Effective Career Guidance”](http://www.slaai.lk/proc/2006/chatura.pdf), Chathra Hendahewa et al
* [“DYNAMIC ACCESS CONTROL MANAGEMENT USING EXPERT SYSTEM TECHNOLOGY”](http://www.icsd.aegean.gr/kkemalis/pubs/SETN_CAMES.pdf), Prof. G. Pangalos et al
* [“Allergenius, an expert system for the interpretation of allergen microarray results”](http://www.waojournal.org/content/7/1/15), Giovanni Melioli, Clive Spenser et al

## References

* 1. [*AI toolkit: support site for Intelligent Systems for Engineers and Scientists, Third Edition by Adrian Hopgood*](http://www.adrianhopgood.com/aitoolkit/aitoolkit.shtml)
  2. [*Flex Tutorial by Clive Spenser on LPA web-site*](http://www.lpa.co.uk/ftp/5000/flx_tut.pdf)
  3. [*Allergenius web site*](http://www.allergenius.it/new/index.php/en/general-conceps/2-non-categorizzato/139-the-structure-of-the-exper-system)