Calpp & .^.i

CALPP: Computer Aided Legal Procedures and Proceedings and Artificial Intelligence

Presentation at

TUXEDO 05

SJCE, Mysore

on

12th November, 2005

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Definition of Artificial Intelligence

Artificial Intelligence is the study of the computations that make it possible to perceive, reason and act.

-Patrick Henry Winston, Artificial Intelligence, p.3

- Perception is the apprehension born of the contact of an organ with an object.
  - Sense organs are the seats of perception and intelligence
    - To “sense” is to “know”, have "knowledge"
    - Sense of touch, taste, smell, vision, hearing, reasoning, ...
  - Kinds of Apprehension
    - Indeterminate apprehension: knowledge without any attribute
      - *this is something*
    - Determinate apprehension: Attributive knowledge
      - *this is a laptop computer, a desktop computer, a mainframe computer*

- To Reason is to test validity of perceptions and make inferences from what is known with an object or purpose.
- Action is through movement, speech and other means: animate or inanimate.

-Tarka Samgraha translated by Swami Virupakshananda

Automation of Intelligence

- Sensors could detect or measure physical properties accurately
- Extensive memory, computational power, speed and connectivity
- Action through inanimate, strong, material movements without loss or risk to life.
- Repetitive tasks executed with perfection
- Creative assistance add value and meaning to life
- Intellectual tasks could be replaced with software automation
- Demand for beautiful, unique and meaningful designs
- Delivery of facts with emotion and feeling
- Fine details without losing the big picture
- The spirited mind will not be content to remain within itself.
  It will reach out for chances to prove its worth.
- Knowledge issuing out as action is wisdom
- Reaching out everywhere: Possess the cosmos!

Goals of Artificial Intelligence

- The engineering goal of AI is to solve real-world problems using artificial intelligence as a collection of ideas about representing knowledge, using knowledge and assembly systems.

- The scientific goal of AI is to determine which ideas about representing knowledge explain various sorts of intelligence

-Winston, ibid, p.6

AI Applications

- Long Term Applications
  - Applications stagger imagination
  - Farming, manufacturing, medical care, legal information processing, household work, education – and every conceivable field of human endeavour could use AI

- Near Term Applications
  - Create new opportunities
  - Intelligent people and intelligent computers have complementary abilities. Both can realize opportunities together that neither can realise alone

Comments on legal tools & .^.i

"A.I. is Brain-Dead"

-Marvin Minsky, Co-founder of MIT Artificial Intelligence Lab
http://www.wired.com/wired/archive/11.08/view.html?pg=3

"I sometimes wonder whether our system of case law will stand the strain. The weight is not relieved by our modern research tools like 'Lexis' and 'Eurolex'. They only aggravate it. They tell you, not only of reported cases, but also of unreported cases. So there are more to look up."

- Lord Denning, Landmarks in the Law, p. 369

If this [calpp] includes implementation of human-style common-sense reasoning, you may have tackled a problem that the Artificial Intelligence field has been struggling with for 35 years.

-Richard Stallman

Traditional approach to AI

- Part I
  - A basic understanding of how knowledge can be represented and what methods can make use of that knowledge
- Part II
  - Learning is sine qua non for intelligence. A variety of learning methods
- Part III
  - Visual perception & language understanding

The Representation Principle

Once a problem is described using an appropriate representation, the problem is almost solved.

-Winston, ibid, p.18

Qualities of Good Representations

- Make the important objects and relations explicit.
  You can see what is going on at a glance
- They expose natural constraints. You can express the way one object or relation influences the other
- They bring objects and relations together.
  You can see all you need to see at one time
- They suppress irrelevant detail.
- They are transparent.
  You can understand what is being said
- They are complete. You can say all that needs to be said.
- They are concise.
  You can say what you need to say efficiently.
- They are computable.

Four Friends

One night, four travellers named One, Two, Five and Ten walking through a forest, come to a deep gorge and find that they have to continue their journey across a weak wooden bridge, that won't stand the weight of more than any two of them at a time. The bridge has a few missing logs and they had only one torch with them to guide them across. Also, One takes 1 minute, Two takes 2 minutes, Five takes 5 minutes and Ten takes 10 minutes to cross the bridge, due to their individual abilities. What is the minimum time within which the four friends could cross the bridge?

Representation of the problem

Task	::: Time in minutes
1 and 10 take torch and walk across	: 10
1 returns with torch	: 1
1 and 5 walk across with the torch	: 5
1 returns with torch	: 1
1 and 2 cross with the torch	: 2
Total time:	::: 19 minutes

Reasoning:

One being the fastest, could take Two, Five and Ten across in about 19 minutes.

Is there a better solution ?

4 Friends find a solution!

Task	::: Time taken in minutes
1 and 2 take torch and walk across	: 2
1 returns with torch	: 1
10 and 5 walk across with the torch	: 10
2 returns with torch	: 2
1 and 2 cross with the torch	: 2
Total time:	::: 17 minutes

Philosophy of the Four Friends

With good representations of the problem, it is possible to work out or evaluate solutions.

Though One is the fastest, if he were asked to do all the work he would get tired too soon, but with good distribution, we can save time, conserve resources, and achieve goals with efficiency.

We could replace the elements in the story with modems. data packets, bandwidth; fuel, cars, trips; developers, users, project goals. Distributing resources in an intelligent manner maximises efficiency and minimises strain.

Law as a System of Rules

- Function of Law: to maintain peace and bring about peaceful changes
- Law consists of Rules that are rooted in:
  - Dictates of Reason (Natural Law)
  - Decrees of the Sovereign (Imperative Law)
  - Practice of the Courts (Real Law)
- Rules are concerned with what ought to be done
- They resemble recipes, travel directions, maker's instructions, rules of games etc.
- Rules are of broad application and non-optional character
- Higher rule prevails over lower rules
- All questions which arise for consideration and determination in a court of law are of two kinds, being either:
  - questions of law, or
  - questions of fact

-P.J. Fitzgerald, Salmond on Jurisprudence

Representation of Legal Rules

- Procedures
  - Logical set of connected rules with a well defined object
  - A procedure has one or more steps
  - Procedures are invoked as proceedings
- Steps
  - Sequence in which rules are executed as events
  - Particulars are collected at each step
  - Describe the work flow transparently
- Particulars
  - Grouped under headings to collect details
  - Data type, controls used, defaults and descriptions
  - Maximum and Minimum limits

Representation of Procedures

- Top level ROOT table that gives the big picture about the legal system
- Universal in scope
- Ideally, it should be located in a large central server and globally mirrored
- Fields in the procedures table
  - procedure_id: Unique primary key; sequentially generated number
  - procedure_code: Unique primary key; connects steps to procedures
    Also connects proceedings to procedures
    -eg: *in_chits; in_tax; in_copyrights, ..., utopia*
  - procedure_name: Description of the procedure
  - source : root from where the procedure originated
  - main_head: broad genus -eg: *chits; taxation; intellectual_property; utopia*
  - sub_head: sub-species
  - country_code: country of origin -eg*: India, USA, utopia*
  - first_step_code: name of the first step
  - first_step: the first step, by default
  - sub_procedure_of : name of a parent procedure, if any.
  - script: code that will be executed whenever a step is invoked
  - procedure_note: object of the procedure

Representation of Steps

task	step	next_step
filing	1	2
service	2	3
reply	3	4
hearing	4	5
adjournment	4	4
verdict	5	0

Adding new steps

task	step	next_step
filing	1	1.5
corrections	1.5	2
service	2	3
reply	3	4
evidence	4	4
hearing	4	5
adjournment	4	4
verdict	5	0

Fields in steps table

- Every record in the procedure table connects to one or more records here:
  - step_id: automatically generated sequential number
  - step_code: grouping code for a given set of logically connected steps
  - step_name: description
  - procedure_code: foreign key connecting procedure with step
  - step: sequence number
  - next_step_code: step_code of next sequence of steps
  - next_step: next in sequence
  - next_time_gap: interval
  - next_time_limit: due
  - time_bar_code: step_code of error handler
  - time_bar_step: sequence number of error handler
  - default_step: select if true for a given set of step_code and step
  - role_of: entity
  - step_source: authority
  - is_multi_step: loop
  - script: code
  - step_note: help

Representation of Particulars

General format:

```
[+][-]Headings
      [+][-]Particulars:  Details
```

Example: Particulars connected to the step “filing”

```
[+][-]Applicant(s) ::

+1                Name: John
                Address: White-acre

[+][-]Respondent(s)::

+1                Name: Doe
                Address: Black-acre

+2                Name: Bim
                Address: Grey-area
```

Representation of Particulars ...

General format:

```
[+][-]Headings
      [+][-]Particulars:  Details
```

Example: Particulars connected to the step “filing”

```
[+][-]Claims(s)    ::

+1    [+][-]Causes
       +1             : Agreed to my terms ..
       +2             : Refused to act accordingly ..
      [ ][ ]Prayer    : Please enforce agreement ..
      [ ][ ]Value     : Rs. 1,00,000/-

+2    [+][-]Causes
       +1             : Causing nuisance ..
       +2             : Disturbing peace ..
       +3             : Unbearably bad ..
      [ ][ ]Prayer    : Please grant injunction against R...
      [ ][ ]Value     : Rs. 100/-
```

Fields in the particulars table

- Every step connects to several records in the particulars table, that has the following fields:
  - particular_id: automatically generated sequential primary key
  - step_id: foreign key connecting the particular with a step
  - particular_code: internal variable name
  - particular_name: description
  - data_type; data_nature: date, numeric, text ...; required, optional
  - control; control_tags: heading, text, select, radio, ...; rows=5 cols=7...
  - rank: order
  - min: minimum count allowed
  - max: maximum count allowed
  - default_min: average count
  - stored_in_table; field_name: given if data is not stored in details table
  - default_value: sql queries are allowed
  - script: code

Functions

A function is a named block of code that performs a specific task, possibly acting upon a set of values given to it, or parameters, and possibly returning a single value.

They improve readability by isolating code that performs specific tasks.

Functions are generally evaluated this way:

$value = function_name([parameter, ...]);

The number of parameters a function requires differs from function to function, and may even vary for the same function.

The parameters supplied to the function may be any valid expression and should be in the specific order expected by the function.

A function's documentation will tell what parameters the function expects and what values are returned

Function parameters, steps and particulars

- Problems with functions
  - Parameters are not described clearly to enable automation of computation
  - There is a need to refer to documentation which may also not disclose logic
  - Functions are overloaded with steps
    - different return values for different parameters
    - the relationship between parameters and return values are not apparent

- Soution: Represent functions logically as steps and particulars
  - Function parameters become well defined when represented as steps and particulars
  - Invalid calls to the functions become redundant and reduce errors
  - Well defined functions help to automate calling of functions with appropriate parameters
  - Enables easier understanding of how a function takes in and returns values

Sample command function : wc

```
WC(1)                          User Commands                          WC(1)

NAME       wc - print the number of newlines, words, and bytes in files

SYNOPSIS       wc [OPTION]... [FILE]...

DESCRIPTION
       Print newline, word, and byte counts for each FILE, and a total line if
       more than one FILE is specified.  With no FILE, or when FILE is -, read
       standard input.

       -c, --bytes             print the byte counts

       -m, --chars             print the character counts

       -l, --lines             print the newline counts

       -L, --max-line-length   print the length of the longest line

       -w, --words             print the word counts

       --help                  display this help and exit

       --version               output version information and exit

Written by Paul Rubin and David MacKenzie.
```

steps and particulars for proc wc

```
Steps:  [step_code::wc]                    Particulars:                    Details:
==============+======+===========          ======+=================== =================
step_name     | step | next_step            key  |  particulars          detail
==============+======+===========          ======+=================== =================
version       |  1   |    0      ====> [ ][ ]|--version          :
--------------+------|-----------          ------+------------------- -----------------
help          |  1   |    0      ====> [ ][ ]|--help             :
--------------+------+-----------          ------+------------------- -----------------
word_count    |  1   |    0      ====> [ ][ ]|--bytes            : -b
--------------+------+-----------          [ ][ ]|--chars            :
                                           [ ][ ]|--lines            : -l
                                           [ ][ ]|--max-line-length  :
                                           [ ][ ]|--words            : -w
                                           [+][-]|--files
                                            +1   |                   : /home/raman/*.txt
                                            +2   |                   : /home/calpp/*.txt
                                            +n   |                   : /home/index/*.txt
                                           ------+------------------- ------------------
```

Representation of Proceedings

- Proceedings <=> Procedures
  - Every proceeding is given a unique name and proceeding_id
  - Stores last completed step, next_step due date
  - Records start, closure time_stamps

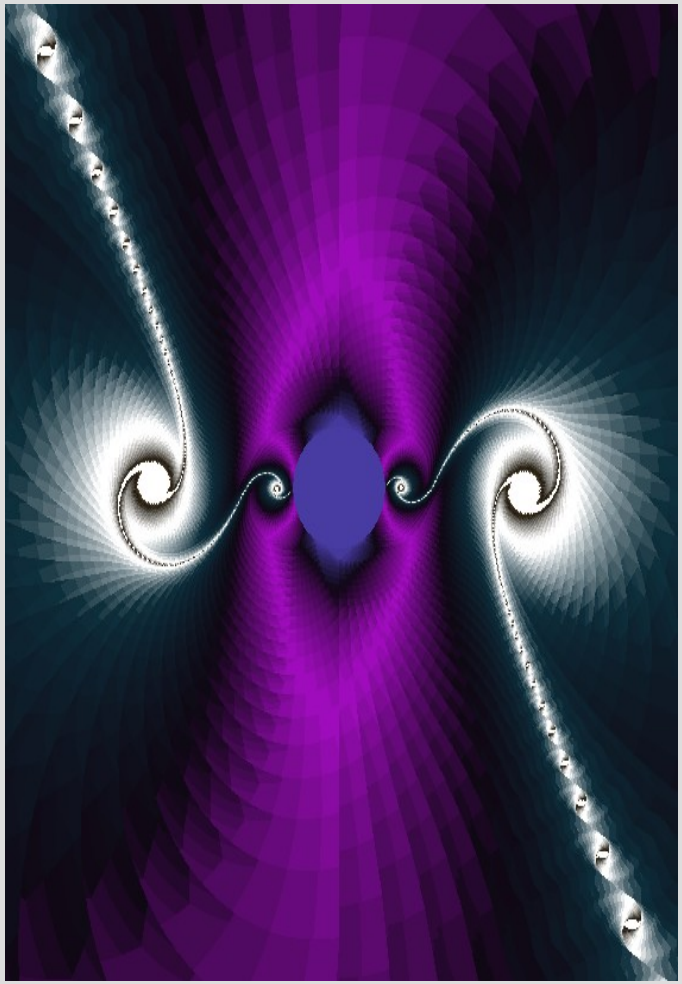
- Events <=> Steps
  - Stores proceeding_id, step_id invoked and step_count
  - Audit trail with details about:
    - entry_person_id along with time_stamp
    - verification_person_id with time_stamp
    - audit_person_id with time_stamp

- Details <=> Particulars
  - Stores detail_id, event_id and particular_id
  - heading_count
  - key_count
  - **DETAIL**

Index to Indexes

- Index
  - Procedures
  - Procedures, steps
  - Procedures, steps, particulars
  - Proceedings
  - Proceedings, events
  - Proceedings, events, details
  - Procedures and Proceedings
  - Procedures, Proceedings, steps and events
  - Procedures, Proceedings, steps, events, particulars and details
  - Index any field by any field
- The plane of the mind
  - Automate index generation
  - Perform computations with procedures and proceedings
  - Automate creation of procedures
  - Artificial Intelligence is here to stay

The BIGGEST



What is Big?
If you ask what is big, thrower of the fiery spear,
Big, big the world is big,
But the world was created by Brahma,
Four headed [Brahma] came from dark Thirumal's
middle,
Dark Thirumal rests on the milky ocean,
Milky ocean fits the fist of the short sage,
The short sage was born in kalasam,
Kalasam is a tiny grain in the Universe,
Universe is borne on a head of the serpent,
Serpant is Uma's little finger ring,
Uma is within Sivan's half,
Sivan is within the beholder's mind,
Could there be anything bigger than
praising the beholder's mind?

-Avvayar

Possess the Cosmos

Lord Muruga, son of Lord Siva, asks Avvayar, the Tamil poetess, what is big?

Avvayar starts with the world that is big. But bigger is Brahma who created the world. Even bigger is Vishnu from whose middle, Brahma emanated. But then, Vishnu himself rests on the milky ocean. The ocean fits the fist of the short sage Agathiar. Agathiar is believed to have swallowed the ocean once, and he was born in the "kalasam". The "porul" or meaning in tamil poems is usually very deep and varied. In Ramayanam, Sage Valmiki narrates the birth of Agathiar in a pot or kalasam. It could also be taken to mean the birth of Agathiar under the constellation of kumba, that is represented by the symbol of a pot or kalasam. The next line makes sense with either interpretation. The kalasam in which Agathiar was born is but a tiny grain in the universe. The constellation kumba, under which Agathiar was born is also a tiny grain in the scheme of the cosmos. The universe is lightly borne by the serpent. The serpent is a symbol for the sense organs, and also a symbol for the string of heavenly objects that appear like a snake. The serpant is merely a ring for Umai, who is exactly half of Sivan. Sivan is a symbol for life, love, mind, and the cosmos. Such Sivan is in the mind of the beholder. Sivan is believed to hold court in the plane of the mind, lying between the eyes.

Mind & Cosmos

Tirumular's Tirumantiram says:

Straight within the fore-head
Between the eye-brows
Is the astral space vast;
Peer, peer within there
The luminous Mantra (Aum) will be;
The place where they in yearning sought Him
Is the place where He in yearning is;
That verily is the Holy Temple of Chittambara
And there did I firmly sit. [2770] -[Translation by Dr. B. Natarajan]

Avvayar concludes that the biggest is indeed praising and admiring the vast cosmos that is experienced within the mind, the macrocosm within the microcosm.

The plane of judgement is not perturbed by movement.

Vision possesses the cosmos.

Reach the stars with **Calpp & .^.i !**

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