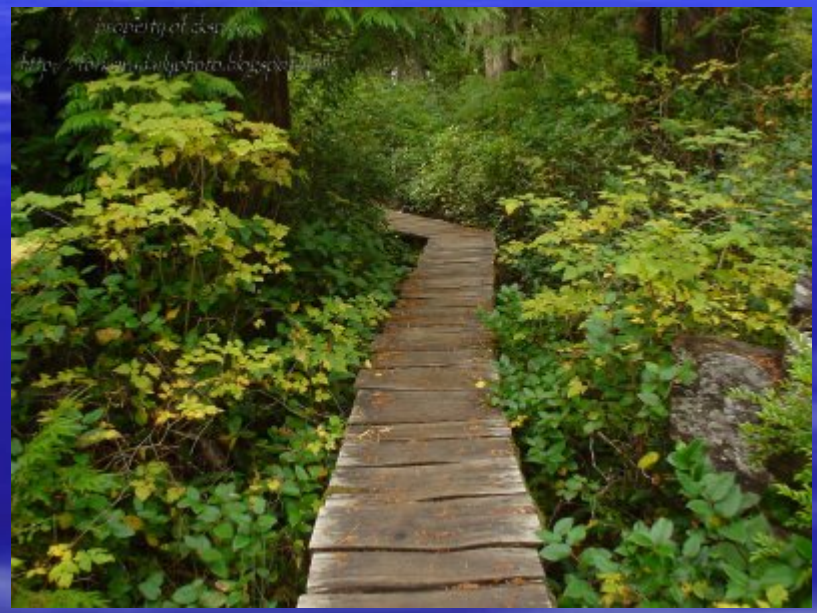
PARTICULAR STUDY CASES FOR PATHWAYS OF KNOWLEDGE



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OUTLINE

- INTRODUCTION
- PRESENTATION OF THE CASES
- COMPARISON
- CONCLUSIONS

INTRODUCTION

Four cases are analyzed:

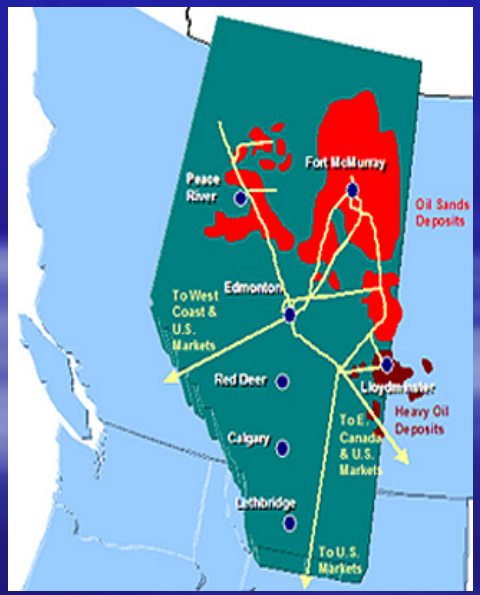
- CASE 1: Characterization of Heavy Oil
- CASE 2: Real-Time Drilling Analysis Technique
- CASE 3: Power Signaling Based Technique for Detecting Islanding Conditions in Power Systems
- CASE 4: Web Service in Knowledge Exchange

CASE 1: CHARACTERIZATION OF HEAVY OIL

Carlos Giraldo

BACKGROUND

- Alberta's oil sand deposits were described by Time Magazine as "Canada's greatest buried energy treasure," and "could satisfy the world's demand for petroleum for the next century".




Alberta Tar Sands © Garth Lenz

BACKGROUND

- Few data are known in literature regarding transport and thermodynamic properties of heavy oil
- Considering this fact, the department of Chemical and Petroleum Engineering at the U of C is committed to developing new technologies in order to recover heavy oil

BACKGROUND

- Currently, there is cooperative work between a consortium composed by Shell, Petrobras, TOTAL, SYNCRUDE and a research group at the U of C

How did the process start?

- The leader of the group foresaw that big oil companies may be interested in obtaining information about the heavy oil, in particular, distillation curves
- A grad student was hired to look after the problem
- Knowing that traditional methods are not appropriate for this type of crude oil, new alternatives were proposed

How did the process develop?

- Once preliminary results were encouraging, Shell got very interested and increased the funding
- Likewise, this grad student was hired for a 1-year internship at the Shell research centre

Benefits for Non-academic Partner

- Shell will obtain valuable experimental information that will allow them to improve their models

Benefits to researcher/student

- Ability to communicate effectively in an interdisciplinary environment
- Lab experience
- Project management
- Networking
- Recognition

Problems/Barriers

- Time: People working in the industry spend most of their time solving daily problems
- Return of the investment as soon as possible

Case 2: Real-Time Drilling Analysis Technique

By:

Mohammad Fazaelizadeh

Introduction

- An Introductory Movie Clip about drilling operations

Background

- For any oilfield development, drilling cost will be at least 50 percent of total cost.

- The cost of each well vary from several hundreds thousands to several million dollars.

Background

- Currently three universities are working in petroleum engineering:

1. University of Calgary (One professor)
2. University of Alberta (Two professors)
3. University of Regina

Note:

None of them has drilling department. It is time to look at drilling engineering as science not operation.

Cost of Each well depends on:

- Depth (shallow/deep)
- Location (Off shore/On shore)
- Type of well (production/exploratory)
- Country (different country has different policy on environment, labor force salary,.)
- Type of reservoir (High pressure/low pressure)
- Type of the rig

Objectives:

- The objectives of real time drilling analysis technique are:
- Maximum Rate of penetration
- No problem during drilling

Note:

To achieve Maximum ROP without problem, it is necessary to monitor all drilling operations and compare with some reliable reference simultaneously.

Field Data Recordings

- The mud logging unit is in charge of recording all drilling process data.
- The monitored data can be interpreted only by high experienced personnel in the oilfield
- Usually there is no reference or complete reference for judgment during drilling operations

Real time Drilling Analysis Technique

- It can provide a reliable real-time reference for all drilling operation.
- Currently real-time drilling laboratory in U of C is in charge of this technique.
- 12 full-time grad students and post doctoral staff are working on it.

Real -Time Drilling Analysis Technique

- There should be some connection between University and Industry by satellite.
- The field and modeled data plot versus measured depth during all drilling processes.
- if difference begin to increase, it means some thing is going wrong during drilling operations.

Real -Time Drilling Analysis Technique

- Grad students and researchers can make some comments on online drilling process based on their knowledge.
- Drilling engineers on the oilfield can make some explanation on the phenomena which will not fully covered by modeling equations.
- It can help to improved the models for future.

Benefits

- University staff access field data online. It can provide a virtual environment for them to feel they are on the rig site.

- They can follow all drilling operations ,drilling problems, challenges, improvement etc.

Benefits

- Also for people in the oilfield, they will be aware of any upcoming problem.

- By university knowledge ,the engineers in the oilfield can reduce drilling cost by selecting optimum drilling parameters with safe conditions.

Results

- This collaboration result in :
- Huge saving in money/time/energy in oilfield development.
- Increase experience of students and research staff in the university by working with live field data.
- Increase knowledge and education level of people in the oilfield.

CASE 3: Pathway- Patent

Ming Dong

Pathway--- Patent

- What is a patent?
- Patent subjects
- Patent composition
- Patent fees
- Patent case in my lab

What is a Patent?

- An exclusive right to make, sell or use an invention
- A bargain between inventor and the public
- disclosure of technology for public benefit
- limited period of exclusivity

Patent subjects

- Inventions:
  - New
  - Useful
  - Non-obvious (higher threshold of originality than copyright)
  - Process, machine, manufacture or composition of matter…

- Software, Internet (Business Methods)
  - Higher Life Forms present new troublesome issues

Patent composition

- Description (figure, text for background and details)

- Claim: a series of specified elements and corresponding limitations to define the extent of the protection conferred by a patent
  - **Central claiming system**, according to which the claims identify the "centre" of the patented invention.
  - **Peripheral claiming system**, according to which the claims identify the exact periphery, or boundary, of the conferred protection.

Patent fees

- Patent Application Filing Fees ($300)
- Patent Search Fees
- Patent Examination Fees
- Patent Post-Allowance Fees
- Patent Maintenance Fees ($3800/y)
- Patent Extensions of Time Fees
- Patent Appeals/Interference Fees
- …

Example in my lab

- Power signaling based technique for detecting islanding conditions in Electric Power Distribution Systems
- Patent No.: US 7,304,403 B2
- Date of Patent: Dec.4,2007

How did they start?

- The theoretical idea started almost 5 years ago.
- Literature review on existing power line communications & anti-islanding methods.
- Lab calculation
- Lab simulation

How did they develop?

- Made a prototype in the lab
- Cooperated with Manitoba Hydro
  - Manitoba Hydro provided testing fields(substations in Winnipeg)
  - Helped to acquire data.
- Filed a patent
  - Patent fees were paid by Manitoba Hydro

Note: Manitoba Hydro is not the patent holder

How did they develop?

- Sold the patent to a local Edmonton consulting company (ACTFS).
- This company is responsible to commercialize the patent from a prototype to a mature product.
- This company then can sell the products to Manitoba Hydro or other utilities which want to buy them.

What are benefits to non-academic partner?

- To Manitoba Hydro, it improves their operation security associated with connecting renewable energy sources into power grid
- To ACTFS, it becomes their product which will be sold to Manitoba Hydro and other utilities. Profits will be created.

To researchers

- Opportunities to do further research and correct the original idea.
- Opportunities to gain field data and testify the theoretical idea by field experiments.
- Opportunities for students to participate in work in utilities. Better for resumes.
- After the patent was issued, two qualified related papers were published too.
- Money from selling the patent can support other researches.

Barriers

- Hard to get funds for patent fees
- Hard to find companies that are interested in the patent

Case 4: Web Service In Knowledge Exchange

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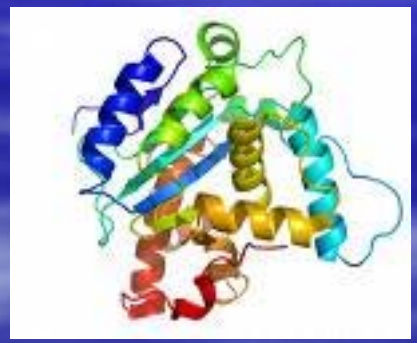
Bioinformatics Lab
Dept. of Computing Science
University of Alberta

Introduction

- My supervisor
  and his 17 years old computer program

- Our Lab: What we have been working on?
  - Multi-discipline
  - Protein 3D Structures
  - Human Metabolome
    - Small molecules in human bodies
  - Web Service
    - From the beginning of this century



What's Web Service?

- A special case: WWW
- Online databases
- Online software
- Examples
  - Google
  - Amazon
  - Microsoft Office Live

Web Service In Our Lab

- 20+ servers / websites
  - HMDB: Human Metabolome Database
    - Detailed information about small molecule metabolites found in the human body
    - Order biological samples
  - DrugBank: Database for drug structure and functional information.
  - PPTDB: protein property information
  - CS23D: protein 3D structure prediction
- Accessible all around the world
  - Over 7 million hits from 27 countries in July 2009

Benefits

- Frequent users
  - Biologists
  - Chemists
  - Medical researchers
- Useful tools
  - More than 20 years of expertise in protein research
  - Saved the expense and trouble of maintaining an IT group
    - Software could be complicated to install and run
    - Some tasks require multiple software to work together

Barriers

- Expense on maintaining servers
  - Endless update
    - Security
    - New hardware and software
  - Cost
    - Hardware
    - Software
    - Human resources
- Getting feedback from users
  - It is not fun to complain!
  - We want feedback to improve our service

Conclusions

- Web service provides a medium
  - Requires IT knowledge and continuous maintenance
  - Could be rigid
  - Tirelessly reach out to a huge # users
    - Users: More choices
- To Chris' question: WS could be a solution

Suggestion: Online Consortium

- Building academic – industrial connection
  - A directory of all researchers in Alberta
    - Help users finding partners
  - Why not home pages
    - Scattered in different university web sites
    - Multi-discipline area
      - Researchers from different departments may work on the same problem
    - Some have no home pages
    - Overly simplified homepages
  - Why not Facebook
    - Different focus
    - Different functionalities

What's in the Online Consortium

- User profile
  - Academic users
    - Expertise / Research areas
    - Collaboration / connection to seek
    - Contact persons
      - Maybe grad. Students
  - Industrial users
    - Introduction / Products
    - Open problems / positions
- Advanced searching ability
  - Matching users of the same interests

Benefits of Online Consortium

- To academic users
  - Build collaboration between academic researchers
    - Multi-discipline projects
  - Real-life data and new research directions
  - Find business partners
- To industrial users
  - Local technical support
    - Especially for small company and start-up
    - Inexpensive and convenient
  - Ideas for new products

Case Name	Pathways of knowledge	Benefits	Barriers	Pros	Cons
Characterization of heavy oil	Internship and Research collaboration.	Industry: Valuable experimental information Student: networking, communication skills, project management	Time, money	Real-time transfer of knowledge	Confidentiality. Creation is narrowed down.
Real-Time Drilling Analysis Technique	**1.** Long – Distance Collaborations **2.** Patent	**University:** Virtual field area, improving current models **Industry:** Fast and Safe operations result in huge saving	1. Industry can believe university research knowledge? 2. How much model can predict field exceptions.	Optimize Drilling operations to save Money exchange of Knowledge and Experience	-Model will cover all phenomena -How it can face unexpected problems -Long distance discussion
Power signaling based technique	Patent	Manitoba Hydro: New technology; ACTFS: New Product; University: Funds, field test, students working	Patent fees; Hard to find companies	A good way to transfer idea into product; Easy to get funds if sold out; Idea Protected	Not easy to be known by potential companies; Being protected means being away from public
Bioinformatics Web service	Expertise sharing via web service	Handy and free expertise to the public	Human-machine interaction	Easily accessible to a large # of users	Not easy to get feedback; Require a lot of IT support