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Investigation and Inquest Risk Management Systems for Rail Transport of HGL

Dumitru Paraschiv

Universitatea Petrol-Gaze din Ploieşti, bd. Bucureşti,39, Ploieşti
e-mail:dumitruparaschiv007@yahoo.com

Abstract

The petroleum products are taken from the refineries to the depots by bulk transport methods: pipelines, trains of tanker wagons, river/canal barges, boats. If an incident results in fatal, potentially fatal or serious (life changing) injuries then the managers are obliged to thoroughly investigate the full circumstances.

Key words: *petroleum products, pipelines, trains of tanker wagons, boats, managers.*

Introduction

This paper describes the design of a normative engineering risk management system that performs four activities: diagnosis, dynamic evolution, decision making, and information gathering. The problem domain can be represented as a partially-observable Markov decision process (POMDP). Another strategy consists of using hidden Markov model (HMM) techniques to learn a model of the environment, including the hidden state, then to use that model to construct a *perfect memory* controller. Chrisman showed how the forward-backward algorithm for learning HMMs could be adapted to learning POMDPs. He, and later McCallum, also gave heuristic *state-splitting rules* to attempt to learn the smallest possible model for a given environment. The resulting model can then be used to integrate information from the agent's observations in order to make decisions By decomposing the POMDP into a separate model to be tailored to a particular situation. Our goal is to construct a normative system that creates an accurate, concise decision model and that provides timely, realiable results. POMDP research has typically been focused on planning using existing POMDP models. The goal of this project is to use active learning to discover the parameters of the model itself. By requesting information from an oracle, a POMDP model is refined over time to better approximate the real world.

Now we are left with the problem of finding a policy mapping belief states into action. This problem can be formulated as an MDP, but it is difficult to solve using the techniques described earlier, because the input space is continuous. Chrisman's approach does not take into account future uncertainty, but yields a policy after a small amount of computation. A standard approach from the operations-research literature is to solve for the optimal policy (or a close approximation thereof) based on its representation as a piecewise-linear and convex function over.

Figure 1 illustrates the basic structure for a perfect-memory controller. The component on the left is the *state estimator*, which computes the agent's *belief state*, *b* as a function of the old belief state, the last action *a*, and the current observation *i*. In this context, a belief state is a probability distribution over states of the environment, indicating the likelihood, given the agent's past experience, that the environment is actually in each of those states. The state estimator can be constructed straightforwardly using the estimated world model and Bayes' rule (figure 1).

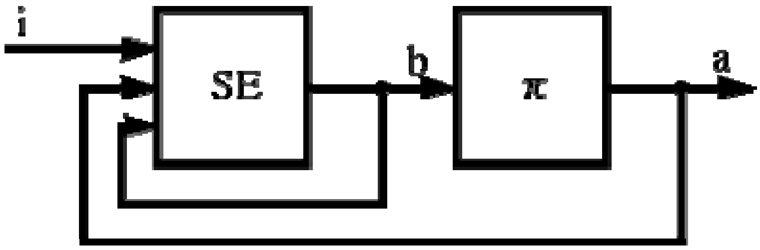

Fig.1. Structure of a POMDP agent.

The decentralized partially observable Markov decision process (DEC-POMDP) framework is a model to represent multiple agents making decisions under uncertainty. It is an extension of the partially observable Markov decision process (POMDP) framework and a specific case of a partially observable stochastic game (POSG – figure 2).

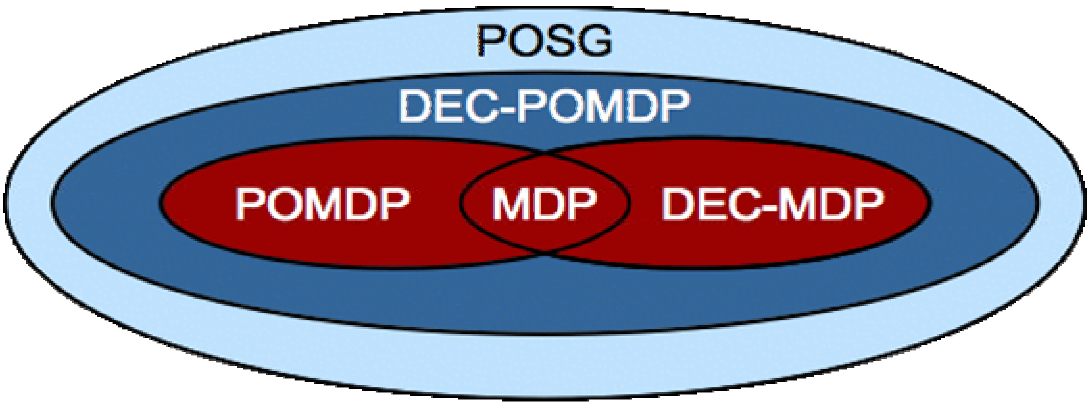

Fig.2. Structure of a POSG.

Optimal and approximate algorithms have been developed for general DEC-POMDPs and many subclasses. The worst case complexity of the general case has been shown to be NEXP-complete (Bernstein et al., 2002) with optimal solutions found by dynamic programming (Hansen et al., 2004) and approximate solutions may be found using bounded policy iteration (Bernstein et al., 2005). A reduction in complexity is seen when the agents are mostly independent (Becker et al., 2003) and communication can be explicitly modeled and analyzed (Goldman et al., 2004).
Well the conspiracy theorists are out there again conspiring as to why the cost of gas has risen so drastically in the last week or so. We are not sure what to believe but I thought I would pass this along. Here's an article from Oil Watchdog.org. The price of oil scaled new heights yesterday, climbing up over $80 US for the first time ever. That's good news if you're an oil company, but bad news if you're a regular folk who likes to go places, or do things, or eat stuff.
Premier Oil has developed an integrated Health, Safety, Environmental and Security Management System (HSES Management System) to ensure that our managers are systematically applied, and that best industry practice is adopted within all operations. The Management System is based on the industry model prepared by the Association of Oil and Gas

Producers (OGP) and fully complies with International standards ISO 14001 and OHSAS 18001. The program of risk management is intended to help you better protect and enhance your organization's value through a comprehensive enterprise risk management. You will learn, through an integrative approach, how to identify enterprise risk exposure, develop ways to manage and mitigate enterprise risk, and be able to communicate them to the senior executives for rail transport of HGL. Methodology and Process Management principles are important to ensure that all stakeholders have a common understanding of the approach the teams/organization will be taking to complete projects.

Whatever the country, petroleum refineries are never very numerous. Some countries do not even have any. In any case, taking the petroleum products directly from the refinery to the customer would be too complicated: it would require large numbers of road tankers covering enormous distances. The products therefore transit by intermediary storage centres, which are responsible for supplying a region: these are the petroleum depots. These depots are also necessary for another reason: to meet possible interruptions in the supply chain, for example a halt in the supply of crude oil to the refinery or a drop in the output of finished products. In fact, the operators of the petroleum distribution network in many countries, including France, are responsible for maintaining stocks equivalent to 3 months of consumption, quantities known as strategic stocks.

A petroleum depot consists of 10 to 30 steel tanks. A tank can be as large as 60 000 m^3. Each depot has 3 to 12 loading bays for the road tankers that will deliver the products to different consumers.

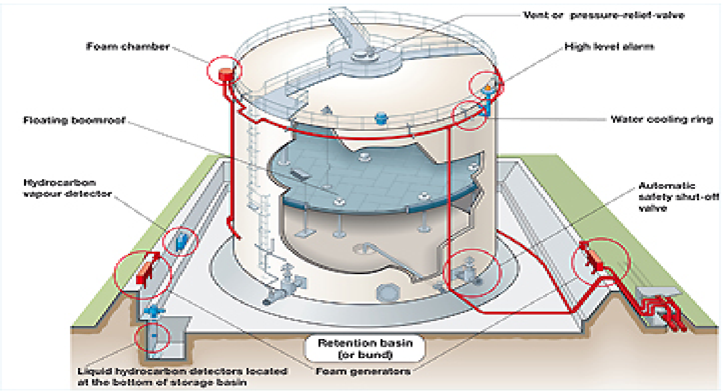

Fig.3. Simplified cross section of an oil tank.

Fig.4. A hydrocarbon storage at the petroleum depot in le mans, with fire extinguishing system in the foreground.

In France, there are 60 or so main depots, belonging to the major petroleum operators. They supply filling stations and numerous secondary depots run by independent retailers. The road tankers used transport 10 to 30 tons of one or several products (in the latter case, the tankers are divided into compartments).

The products are regularly inspected throughout the whole distribution chain, from the refinery to the end user, to guarantee the maintenance of product quality and the absence of contamination by mixing

In France, the petroleum operators must meet the demands imposed by a steady reduction in the number of depots: more than 300 depots of more than 400 m^3 were closed between 1973 and 2001(figure 4).

Controllers Fuel is the leading certified provider of Ultra Sonic Oil Tank Testing Services in Southern NH. If you use Residential Heating Oil #2 and Kerosene and want to protect the economic investment of your home and oil tank, contact controllers Fuel for Ultra Sonic Tank Testing in Greater Manchester, NH, including Bedford, Auburn, Hollis, Candia, at the petroleum depot in le mans, with fire extinguishing system in the foreground.
Hooksett, Goffstown, Merrimack, Deerfield, Allenstown, Suncook, Londonderry, Derry, Amherst, Litchfield, Weare, Dunbarton, Pembroke and New Boston. Controllers Fuel uses advanced, patented technology for tank testing (similar to a medical ultrasound), allowing us to give you a sense of security – or plenty of advanced warning that a problem is on the horizon. We utilize scientific analysis and monitoring along with an EPA-certified testing technology to help mitigate oil tank leaks and spot issues before they occur.

Controllers Fuel offers the most qualified Service Department in Southern NH. This means we will help you determine how to fix your issue in the most economic manner, meeting and exceeding your expectations in a way that only a specialized heating company can. This includes ensuring your entire system is designed correctly in ways that contracting companies are not familiar with. All of our work is backed by our service guarantee and applicable manufacturer warranties.
Oil Supply tanks - reservoirs are used to supply oil to engines and compressors. Many times the Oil Supply Tanks are installed with an Oil Level Regulator to assure proper oil levels. Tanks are mounted so there is a minimum fluid head of six (6) inches with a short supply line or hose of ½ ”internal diameter as supplied with the kit. No more than 10 feet (3.1 meters) of hose full of fluid attached to the Oil Supply Tank-Reservoir should precede the Ren Oil Level Regulator.
Most local government organizations have automated systems; however, not all have automated data systems to track the full cycle of land use and construction. "Development Management Systems" provides an overview of system selection to meet needs in planning and regulation. Implementing an automated system for permitting, code enforcement, and land management, for instance, yields benefits in improved customer service, increased staff productivity, and improvement of analytical capabilities. Conserved model components are constructed at design time whereas unique features are custom at run time. For run-time model structure, human guidance is used sparingly to refine the decision model. A somplified gas compressor module ilustrates the context for the example problem treated in this paper. Gas enters, flows through two parallel compressors, and exits. Pressure detectors (PD) monitor internal gas flow, and level detectors (LD) monitor external released gas. After a leak alert, the promary decision is the choise of an appropiate shutdown level given obsevations (automatic and human) and the known dynamics of leak evolution. Information gathering allows the primary (shutdown) decision recommendation (figure 5).

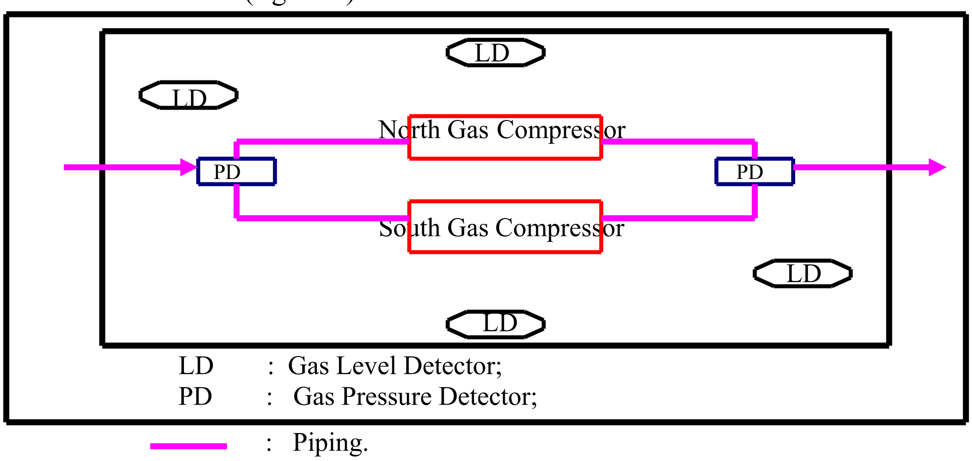

Fig.5. Gas compressor module layout.

Customs asymmetry is most extreme for information gathering. The chalenge in designing Engineering Risk Management Systems is (1) to identify and characteriye the risks involved in the different failure modes and (2) to do so early enough to recommend a decision path and information-gathering response in a dynamic environment that avoids catastrophic decline of the target system state.

Production of oil sands is also extremely water intensive, requiring three barrels of water to produce each barrel of oil. This is threatening the ecosystem of the Athabasca river by reducing flows to dangerous levels.

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The development of a large-scale normative system to handle a problem of realistic complexity presents domanin-dependent (e.g., modelling gas leak evolution) and general challenges. Most importantly, nonmyopic information gathering is exponentially complex and is highly dependent on the complexity of the diagnosis, dynamic evolution, and decision-making models. The current normative diagnostic system are improved by the addition of the dynamic function, a more sophisticated primary decision model, and expansion of the information gathering function beyond the myopic (one step ahead) case. Second, and intelligent search algorithm priority promising sequences of information-gathering alternatives. Finally, „anytime algorithms", identify the best alternative encountered so far at any intermediate point in the complete evaluation. The design is illustrated here for fire risk management onboard oil and gas platforms. Our work became the basic for the design of a prototype (Advanced Risk Management System: ARMS) for real time risk management of fire risks on board offshore platforms, with emphasis on the detection of leaks.

Our problem is a sequential decision process in that a sequence of secondary information-gathering decision (e.g., inspect production wquipament, obtain advice from onshore facilities) precedes the primary decision of how to respond to the possible gas leak (e.g., full production shutdown, platform evacuation). Diagnosis, dynamic evolution, decision makimg, and information gathering can be represented by an influence diagram of a partially observable sequential decision process.

Current intelligent decision system are improved by the addition of the dynamic and diagnostic functions, and modification of the interactive primary decision model formulation.The appropiate balance among the four major activities depends on the particular application domain.

Interactive model formulation, wherein human operators select from pre-defined model structures, can be combined with the architecture of Engineering Risk Management System presented here.

If an incident results in fatal, potentially fatal or serious (life changing) injuries then the managers are obliged to thoroughly investigate the full circumstances. Life changing injuries being those which are likely to result in a significant change of lifestyle for example the loss of a limb.

Intelligent Decision System (IDS) are example of interactive man-machine modelling system for complex problems. Starting with fixed templates that represent the links between diagnosis and decision making, IDS techniques can guide the user in model refinement for a particular decision. Each of these layers provides a different function. The layers do not need to exist in clear and distinct physical entities, but the functionality needs to exist in an enterprise network. To help understand these functional layers, the traditional layers have been modified to *access* or *workgroup*, *distribution* or *policy*, and *core* or *backbone*.

Intrusion Detection System (IDS) technology is an important component in designing a secure environment.

Using our agents platform we have designed a distributed intrusion detection system. (DIDS). For this purpose the *monIDS* monitoring module was developed. It collects and publishes the information generated by a local instrusion detection engine (i.e SNORT,but other engines may be supported). An specialized IDS Agent is running on the MonALISA service and in case of an alert it takes custom reactive actions (e.g. adding a blocking rule in firewall) and also broadcasts the alert in its communication group. In this way the other services can prevent possible future attacks from the same host.

The attacking hosts are dynamically moved in a black-list based on the attacks level and the frequencies of them. A periodical report containing the intrusion alerts is generated and sent to the farm administrator.

Intrusion Detection Systems (IDS) allow detecting inappropriate, incorrect, or anomalous activity in computer networks. ID systems that operate on a host to detect malicious activity on that host are called host-based ID systems, and ID systems that operate on network data flows are called network-based ID systems. Host-based IDS is typically a piece of software being loaded on the to be monitored system. The IDS software uses log files and/or the system's auditing agents as sources of data. Host-based IDS involves not only looking at the communications traffic in and out of a single computer, but also checking the integrity of your system files and watching for suspicious processes. To get complete coverage at the monitored site with host-based IDS, the host based IDS need to be loaded on every computer. There are two primary classes of host-based intrusion detection software: host wrappers/personal firewalls and agent-based software. Either approach is much more effective in detecting trusted-insider attacks (so-called anomalous activity) than is network-based IDS, and both are relatively effective for detecting attacks from the outside. Host wrappers or personal firewalls can be configured to look at all network packets, connection attempts, or login attempts to the monitored machine. This function can also include dial-in attempts or other non-network related communication ports. A network-based IDS monitors the traffic on its network segment as a data source. This is generally accomplished by placing the network interface card in promiscuous mode to capture all network traffic that crosses its network segment. Network traffic on other segments can't be monitored

While there are several types of IDSs, the most common types work the same. They analyze network traffic and log files for certain patterns. What kind of patterns you may ask? While a firewall will continually block a hacker from connecting to a network, most firewalls never alert an administrator. The administrator may notice if he/she checks the access log of the firewall, but that could be weeks or even months after the attack. This is where an IDS comes into play. The attempts to pass through the firewall are logged, and IDS will analyze its log. At some point in the log there will be a large number of request-reject entries. An IDS will flag the events and alert an administrator. The administrator can then see what is happening right after or even while the attacks are still taking place.

The signature/pattern detection relies heavily on a database of, you guessed it, signatures and patterns! This means the known probing tools, like the ones used by "script kiddies." The common Trojans that are all over Mirc, and various worms have a consistent pattern of how they send and receive data. A database will include the signatures or patterns used by these programs. It constantly monitors the network and when there is activity that matches something from the database, the red flag goes up. An IDS can play pretty much any role you need it to play. For instance, software can be installed on a workstation (like specter) to monitor requests from other parts of the network or outside traffic. An IDS can also be used in conjunction with other network devices. The diagram below shows an example of setting up a dedicated machines with IDS software. Notice the Enterasys Dragon is located in the DMZ. Placing a decoy in the DMZ will deter hackers from the rest of the network. Taking the time to trip the IDS gives system administrators time and data to analyze.

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A major compressed gas company experienced a leak in a flammable gas panel. Because the location was small, a local contractor, who had worked on such systems in the past, was called in. While checking out the system, which was still ”hot”, his cell phone rang. He reached down to his belt, grabbed the phone, and opened it. Instantaneously the gas cloud that surrounded him exploded and seriously burned him.
The following incident highlights another safety hazard, the likes of which many may be overlooked.
This in-turn helps them protect the network (figure 6).

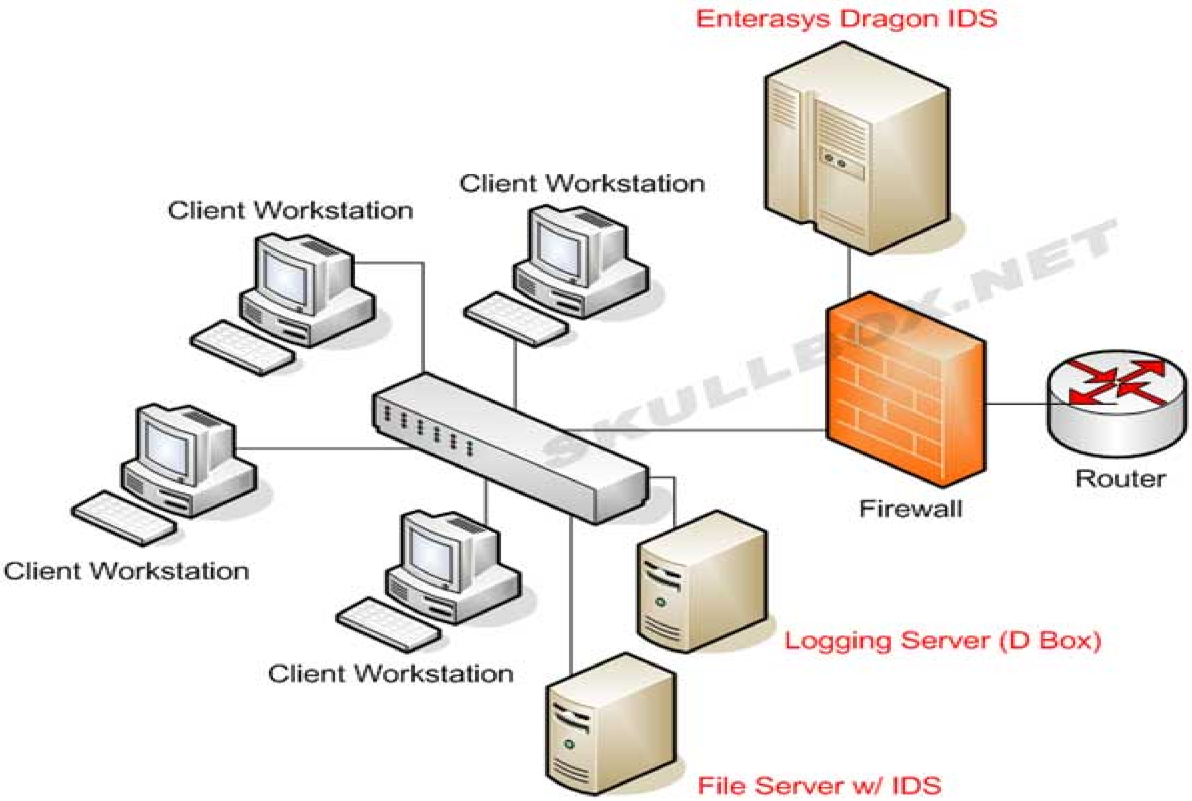

Fig.6. Efficient technique to deploying IDS.

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Investigarea şi anchetarea sistemelor de gestionare a riscului de transport feroviar al HGL

Rezumat

Produsele petroliere sunt luate de la rafinării, la depozitele de transport în vrac, prin metodele: conducte, trenuri de vagoane-cisterne, barje, nave. Dacă se produse un incident în rezultate fatale, potențial letale sau grave (de viață în schimbare), leziuni, atunci managerii sunt obligați să investigheze temeinic toate circumstanțele.