Conceptualizing the Frameworks for an Internet-based, Artificial Judging System

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Conceptualizing the Frameworks for an Internet-based, Artificial Judging System
Assessing Legal Damages for Personal Injury Cases
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Abstract: Legal systems are probably the most nationally entrenched. Yet in an age of increasing global internet presence there are no reasons why information technology (IT) should not be utilized in fostering an internet-based, artificial justice system. In this paper the author focuses on the need for nurturing a triangulated, inter-disciplinary - information technology (IT), legal and medical sciences - collaboration towards a greater, global uniformity in judicial decision making relating to personal injury cases involving whiplashes. In the process, he provides conceptual frameworks for bringing this about. For advances in technology (in particular fMRI; functional magnetic resonance imaging) are enabling a far more detailed imagery of injury sustained in whiplash cases. Through applying pattern recognition technology embedded with medical expertise, it should then be possible to develop a scale for personal injury and particularly of whiplash injuries. Through proximity matching to delineate precisely the extent of the injury sustained. By constructing a global database of fMRI imageries of whiplash injuries, it should then be possible via enhanced IT expertise to create an artificial judging system. Such a globally created artificial judging system may then be further refined through their adoption by judges in the national courts in determining their cases. Through many iterations in particular cases, it should be possible to then evolve an artificial judging system.

Keywords: Internet-based, global artificial justice system, Knowledge and Technology

Introduction

The presence of increasing global access to the internet has yet to spawn a socio-medico-legal movement towards greater internationalizing in the processes of judicial decision making and in particular for personal injury cases. Yet as the author shall argue here, he sees no reason at all why such a development – involving three distinct disciplines of legal, medical science and technology (including IT) - should not be happening within the near future. For it involves an already and even more convincingly, readily available technology as follows:

1. The popularly utilized technology for brain research of functional magnetic resonance imaging (fMRI): technology so powerful as to permit the capture on screen of the firing patterns of brain cells.
2. The widely available technology for pattern recognition and for personal injury cases: in the case of whiplash cases --- the particular injury that inspired this more broadly conceptualized paper --- the fine delineated damage caused to the fibers in the muscles around the neck.
3. The well known techniques of knowledge-building via the construction of expert-based systems. Such expert system, involving firstly and most importantly of the knowledge-base (database of fMRI images) capturing a wide range of injuries, from the slight to the serious. This then need to be nested along with the interfaces and inference engines. To distinguish such expert systems from the reset, the author prefers to term these as artificial judging systems. In short, artificial judges so as to distinguish this from decisions made by human judges.

Clearly, such a development should benefit society on a global basis by ensuring consistency in the awards by judges of damages for personal injury cases and particularly those involving tissues, as in whiplash injury cases.

Why is it not yet Happening?

• Why is this not yet happening?

One main reason is that the development of such a technology benefiting our global society requires the combined intellectual efforts of professionals or experts drawn from two rather distinct and separate disciplines of study. Now the medical and the legal are very old traditional areas of study. Also along with prostitution, they are among the world’s oldest professions.
First, on the medical profession: prior to the 21st Century, the narrowness of disciplinary research and study is the norm particularly within the Western tradition to medical studies. The focus of the West is on the various parts of the body and to specialist knowledge is based on this. In contrast, the Eastern medical tradition is more holistic in approach.

Thus in the West, even within already narrowly focused careers as to practice as a doctor, the pre-internet society then fosters narrowly defined specialties, for example ENT (eye, nose and throat) experts --- and in such a context, technology requiring inter-disciplinary efforts is less likely to happen. For minds nurtured within these professions under such a tradition grow become niche-focused.

Second, on the legal profession: to be a judge or a good advocate in the court requires many years of both scholarly and professional training. Thus there is the widely held belief that judging by itself is an area of expertise. Judging demands long years of experiences in the courts for developing that fine quality of the mind so as to be fair-minded judge.

There is yet another reason more subtle and less obvious why such a technology is unlikely to take roots without the internet. Prior to the internet, knowledge about medical and legal practices are embedded in tomes and in rows after rows of heavy leathered volumes (especially in the documenting of past legal decisions). The internet as an enabling technology is facilitating an easy and immediate public access to both branches of knowledge. The current trend in the internet is towards reinforcing knowledge at finger tips as both Google and Yahoo! are announcing plans for digital libraries.

It is therefore very likely in the foreseeable future, what is in print will also be available on the computer screen. So the internet is facilitating an integration of these two very ancient fields of study. We can expect besides inter-disciplinary research initiatives (as in this case) for a trend towards holistic, technology-facilitated, life-long learning to take roots in the world.

If so, technology will have a critical role of integrating very different sources or roots of knowledge in the creation of new products. Here, we illustrate this possibility: integrating medical, legal and pattern recognition technology towards the building of an expert, medico-legal system, one that is relevant for global society. The next step is for us to outline the major conceptual frameworks that are necessary for bringing about this transition.

Conceptual Framework

The overall goals of this presentation at this The Second International Conference on Technology, Knowledge and Society are as follows:

• On knowledge:
  • Mapping for the benefit of future researchers, the judicial decision making process more as an ‘interaction’ model of knowledge applications to a particular case.

• On technology:
  • Proposing a possible, alternative technological (technical) solution (artificial judging systems or simply ‘artificial judge) to the process of applying knowledge to a particular case.
  • In particular, the possibility of doing away of the need in the future for expert witnesses (hence savings of costs; since expertise are embedded in the artificial judges), especially for routine cases.

• On Society:
  • On how the development of such a technology will benefit society. The basic theme in achieving ‘justice for all’ through internet-based technology.
  • Why? For there to be justice, it has to be easily affordable for that even the poor may have access to the law for compensation.
  • The fostering of a globally valid justice standard: the same injury being given the same score with or on the same measuring scale.

To begin, we present how a grossly oversimplified conceptualization of the process for building a ‘legal science’. One that integrates knowledge sources from court, medical practices and the newly available fMRI technology. The idea is to work towards an expert system for assessing damages for injured persons.
The conceptual framework is presented in the Figure below. Our discussion will focus on the key innovative elements. The first and foremost goal is to create a pathway for researchers to work towards a fostering of a globally standard in the measurement of the extent of personal injury sustained. In other words, no matter where a trial is held, in Singapore, London or New York, the degree of injury suffered is exactly the same. Here we begin with whiplash injury.

This is most easily facilitated by once the expert system is hosted and made available onto the internet. Although technically, it is but a routine matter, the much more difficult challenge is to change globally our thinking on internationalizing the processes of the courts towards adopting a global standard.

Next and here is where we urge for the wider adoption in the use of functional (f) magnetic resonance imaging (MRI) by hospitals internationally as evidence of tissue damage (in our case, the neck muscles) sustained in the neck. Other scanning or imaging devices may not result in the same degree of detail or sharpness in the resolution of imagery. For the latest technology for imagery allows for the precise capture in detail of tissues that had been damaged as a result of the accident.

Third and this is not apparent from the above Figure, is for the courts internationally to adopt the use of the ‘artificial judging system’ once it is been developed as an integral part of their judicial decision making processes. Currently, both parties to the trial at the court, the plaintiff and defendant may call upon their own medical practitioners to act as expert witnesses. The main purpose of developing the ‘artificial judging system’ is to render it unnecessary (especially in routine cases) for the plaintiff to have to bear such expenses. Yet the assessment of the personal injury suffered is accurately determined by using the ‘artificial judge’.

A Proviso

We begin with whiplash injury since there are annually, many of such routine cases. However the same developmental process in developing the technology is very likely (subject to some modifications) may be broadly applicable to other bodily injuries. Below is the typical detailed classification of ‘pain and suffering’ (a technical meaning, to be discussed later) sustained by persons who are claiming for compensation through the court.

### Pain and Suffering

<table>
<thead>
<tr>
<th>Physical</th>
<th>Psychological</th>
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<tbody>
<tr>
<td>Head</td>
<td>Head</td>
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<tr>
<td>Upper Limbs</td>
<td>Upper Limbs</td>
</tr>
<tr>
<td>Brain</td>
<td>Amputation</td>
</tr>
<tr>
<td>Ear</td>
<td>Amputation</td>
</tr>
<tr>
<td>Eye</td>
<td>Ankle</td>
</tr>
<tr>
<td>Face</td>
<td>Foot</td>
</tr>
<tr>
<td>Jaw</td>
<td>Hip</td>
</tr>
<tr>
<td>Neck</td>
<td>Knee</td>
</tr>
<tr>
<td>Shoulder</td>
<td>Lower Leg</td>
</tr>
<tr>
<td>Skull</td>
<td>Upper Leg</td>
</tr>
<tr>
<td>Teeth</td>
<td>Lower Limbs</td>
</tr>
<tr>
<td>Wrist</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>Spine</td>
<td>Abrasions</td>
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<tr>
<td>Spine</td>
<td>Burns</td>
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<td>Testicles</td>
<td>Contusions</td>
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<td>Scars</td>
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It is necessary however to point out, at least, if the trial is to be heard in a court in Singapore or as in many common law-based courts a proviso. That the legal principle behind the award of damages (compensation in monetary terms) by the courts is not (say, for example whiplash injury) not on the basis of “muscle tissues damaged” but rather it is strictly to compensate for the pain.

Pain endured by the person as plaintiff who was wrongfully injured through the negligence of another party. Here one may cite the precise words of Lord Morris who said in West v. Shepherd [1964] as follows: “…If someone had been caused pain then damages to compensate for the enduring of it may be awarded…” (italics added by author). In other words, the key variable is in the degree of “pain” (X) suffered and only then consequently that damages (Y) are granted as compensation. So functionally, we may encase the judicial principle put in its most simple functional form:

- \[ Y \text{(damages)} = f_X \text{(pain)} \]

Strictly speaking, our model captures a different functional relationship. That is we relate Y (damages) to be a function of scaled imagery. We are presuming that the greater the ‘damage’ as evidenced visually in the fMRI imagery and recognized by the pattern recognition technology employed, the more ‘painful’ and thus deserving is the plaintiff in terms of the compensation, legally due.

- \[ Y \text{(damages)} = f_X^1 \text{(pain as evidenced in damage to tissue)} \]

However, as there is very likely to be a threshold in the degree of pain as suffered by a human being, so technically and correspondingly an upper limit on the amount of compensation due legally. Pain is a subject matter that had been extensively researched by medical practitioners. The consensus seems to us to be that pain is clearly a subjective matter. However the person who does not adequately verbalize pain may be suffering as intensive a pain as one who does. One of the more intriguing insights from past extensive as well as intensive efforts of trying to establish a scale of pain from researchers into the verbalization of its intensity by American patients:

“You can’t just do magnitude measures of pain and really get a lot of meaning out of it unless you anchor the judgment some way. Every word response is an anchor to a subjective level” [italics added]


Clearly the road ahead is for some objective, verifiable measure of pain. Here we propose the basis to be grounded on the degree or extent of muscle tissue damage as captured on fMRI scan.

Next we render explicit our underlying assumption.

**Assumption**

Pain and suffering is the fundamental principle underlying the legal basis for compensation. However as we had discussed earlier, there is a limitation to constructing on a medical basis, a measuring scale for reflecting the degree of pain suffered by patients. As such we propose a process for designing and developing the technology (expert system) using objective measures.

In so doing we are assuming that the visual imagery obtained through say, functional magnetic resonance imaging (fMRI) ought to correspond to the ‘pain’ that has been suffered by the claimant. Another way of putting it is that we are assuming the range of imagery we obtain say for whiplash injuries are scalable: that there is an inherent correlation between visual imagery and pain. The fundamental technological assumptions of our proposed methodology we present in the Figure below:
Next we turn to discuss the artificial judge.

**Artificial Judge: Expert System**

The key to developing the measuring scale is to build up a database of cases of persons with f/MRI scans as evidence of say, a range of whiplash injuries. The approach is to have the slight, marginal cases to the very serious in terms of damage to muscular tissues. With such a broad-based database it is possible then to develop perhaps a *continuous* rather than categorical scale (i.e. type 1, 2, 3, or 4). The goal is have in the database the entire range of possible whiplash injuries. With such a range of scans in place, there it is possible for any future plaintiff to objectively scale his or her pain suffered when claiming for legal compensation.

Clearly, this has to be subject to medical refinements.

For example, we need to consider the *timing*: when is the f/MRI scan to be taken. Logically, there ought to be an appropriate time. Immediately after the accident it is unlikely for the damages to be fully reflected. Neither will it be appropriate for the scan to be taken too long thereafter. Theoretically time ought to be benchmarked from the time the accident occurs. To determine this still requires detailed, empirical studies of actual cases. Another factor to be considered is if there is any need for controls to refine the measures. That is to adjust/refine or develop altogether separate scales for possible variations that may affect the nature of the muscular imagery obtained: gender, male versus female; age young versus old or the body per se; the muscular versus flabby or skin types in general.

The generic configuration of an expert system will too be replicated in constructing an artificial judge for assessing damages for persons who had sustained whiplash injuries. This abstracted below for the convenience of readers and briefly described. That there is the end user: legal practitioners, judges and eventually even ordinary people making enquiries. The user interface has to be constructed to access the working memory with interactions (implied by

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**Fundamental Technological Assumptions**

- Visual imagery,
- pattern recognition technology
- f MRI
- "Pain and suffering"
- correlates with visual patterns
Refining the Prototypical Artificial Judge

Such a technology as conceptualized in the artificial judge ought to be introduced in phases. That is before the artificial judge is more widely adopted for assessing damages in particular cases. The stages of introduction may be structured as follows with refinements added after each phase of experimental applications:

- **Phase I**
  - One possibility is to first utilize the artificial judge as a trial, advisory tool for lawyers who specializes in personal injury cases.
  - Being experts in this domain of knowledge they will be quick to see problems, limitations, inadequacies in the expert system. Thus a revised version may be necessary after trial use by legal practitioners. It is very important that the artificial judge wins the whole hearted acceptance of these practitioners. Having satisfied the practitioners, the next stage is to encourage its adoption by mediation centers. This brings us to the next phase in developing the technology.

- **Phase II**
  - Then when it is proven as a useful tool, the next level in the utilization of the artificial
intelligence technology is through the mediation centers.

- Further refinements may be expected to facilitate the use of the technology in dispute resolution setting. Only when it passes this test should the artificial judge be utilized as in the courts.

- Phase III
  - Ultimately, when proven as a tool, the ‘artificial judge’ may be utilized by the parties to resolve disputes — and ideally without having to undergo prolonged and costly litigation in the courts.
  - In the concluding section we shall discuss the social benefits of having institutionalized on a global basis, an artificial court of the future. A virtual ‘court’ that may be accessible to by anyone who had suffered personal injury (especially whiplash) as a consequence of negligence of the driver of a public conveyance or vehicle.

The Artificial Court of the Future

What are the major benefits of having derived through global collaborative research an artificial court (an expert system) for assessing damages due to a plaintiff who had sustained personal injury such as whiplash? The list below is by no means comprehensive but indicative:

- Access by any ordinary person to an objectively determined, hassle free process of fixing the degree of damage to muscle tissue from an accident.
- This especially the case of whiplash injuries suffered as a consequence of being a passenger in a public conveyance, for example a bus.
- For there to be true justice, it has to be accessible — that is affordable. A person on average income often finds the costs of going to trial too prohibitive as it means the involvement of an expert witness.
- The ideal scenario is what that is depicted in the diagram below. That is where the parties contribute to providing evidence. In the case of whiplash injuries, the focus is on the fMRI scan of the injury suffered.

Going one step further, for there to be a functioning artificial court, there ought too to be a ‘written’ judgment simulating the application of mind or ‘thinking’ of the artificial judge (Foo 2001; 2002) to a particular set of facts.

References


About the Author

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Dr FOO Check Teck is currently with the School of Mechanical & Aerospace Engineering, Nanyang Technological University, Singapore. He is concurrently an Honorary Professor of Competitive Strategy in the School of Management, University of St Andrews, Scotland. Unlike many academics, Dr Foo Check Teck takes a diverse, multi-disciplinary, holistic approach in his work. This is reflected in his research publications cutting across disciplinary boundaries with contributions to refereed journals. His papers may be found in journals such as
Omega, Journal of High Technology Management Research, Corporate Communications, Juridical Review, British Journal of Industrial Relations, Organization Studies, CyberPsychology. He is globally renowned for his research contributions to strategy: his doctoral work (Organizing Strategy) emphasized inter-connectivity in strategy and his Reminiscences of an Ancient Strategist: Mind of Sun Tzu won the top NBDCS Book Award in Singapore. He is currently researching into internet-based systems for building a 21st Century global artificial justice system.
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