First-pass report on: "SPINAL CURVATURE MEASUREMENTS BY TRACKED ULTRASOUND SNAPSHOTS" by Ungi et al. in Ultrasound in Med. & Biol. 2014; Vol. 40 (2): 447-54

This paper is one which investigates a clinical protocol for using spatially tracked ultrasound to quantify scoliosis in terms of the Cobb angle. The Cobb angle being the gold-standard metric for quantify scoliosis. It is defined as the maximum angle between the end plates of any two vertebrae. They refer to the health risks associated with using X-ray to determine the Cobb angle, and describe the work of others done to investigate alternative means of scoliosis quantification.

Optical surface topological measurements are inaccurate and do not allow the spine to be visualized [Goldberg2001]. MRI is a potential alternative to X-ray but is expensive and relatively inaccessible [Difenbach2013]. [Suzuki1989] used regular ultrasound imaging to correlate vertebral rotation with the Cobb angle, but this correlation is weak and disappears once patients have begun treatment [Li2010]. [Purnama2010] demonstrated that 3D volumes can be reconstructed from spatially tracked ultrasound images, and from them, vertebral landmarks extracted to measure spinal deformation. [Chen2011] demonstrated that ultrasound-accessible landmarks can be used as a proxy to the Cobb angle. [Zheng2011] measured scoliosis with ultrasound, but their method required special, wide transducers to capture both sides of the vertebrae simultaneously in an axial orientation.

This leads into the contribution of the work presented in this paper. At the time of their writing, no methods for scoliosis quantification have been implemented in clinical practice [Ungi2014]. They investigate a new method for using spatially tracked ultrasound to locate spinal landmarks, and thereby quantify the curvature of the spine.

To my knowledge, the premises of this paper are correct. This should generally be the case which uses existing technology in new protocols; no theory is being challenged or developed, it is just a matter of verifying that this procedure retrieves the required anatomic information. In this case, it is well known that bone surfaces are visible in ultrasound, and that a 3D model can be constructed from a set of 2D images where their relative spatial positions are known.

The context of the work is presented very well. It would be a challenge to present the relevant work more clearly as bullet points. It was slightly more difficult to extract the exact contribution of this work, as it is similar to [Zheng2011], differing mainly in the typicality of the hardware used and orientation of the ultrasound probe. That is not to say their contribution did not become apparent with a moment taken to backtrack to the reference to the similar work I mentioned.

I will likely return to this paper for additional information. In addition to my supervisor being an author, it constitutes part of the foundation for the work I plan to do; the skeletal landmarks demonstrated to be an accurate proxy to the Cobb angle are those which I intend to use as input to a neural network.

On a scale of 1 to 10, the difficulty in extracting the problem statement was about a 2 or a 3. The motivation for research into ultrasound imaging for scoliosis quantification was made clear early on, and as I said above, the context of related works is described very well. I hesitate to give it a 1 just because it didn't explicitly differentiate itself from [Zheng2011], which is somewhat similar. This may speak more to my inexperience with reading academics papers than the writing. Even still, the distinction became apparent after a quick re-read of their description of [Zheng2011].

First-pass report on: "A reliability and validity study for Scolioscan: a radiation-free scoliosis assessment system using 3D ultrasound imaging" by Zheng et al. in Scoliosis and Spinal Disorders 2016; Vol 11 (13)

Like the first paper, this one investigates the clinical applicability of another means of quantifying scoliosis with ultrasound, in particular, with the use of a new machine, the Scolioscan. Following what is apparently standard procedure for writing such a paper, they refer to the risks associated with repeated X-ray exposure during adolescence, and then describe other work motivated by these risks.

They refer to [Dechenes2010] and [Al-Aubaidi2013] who assessed the EOS (they do not define the acronym) as a means of reducing radiation exposure for scoliosis measurement, and say that the system will not be practical for some time. [Zheng2016] also refers to surface topological measurements as being too inaccurate for clinical use according to [Goldberg2001] and [Knott2006]. They refer to a number of works which investigate the use ultrasound imaging to locate bony landmarks [Suzuki1989], [Huang2005a], [Huang2005b], [Li2010], [Cheung2010], [Purnama2010], [Chen2013], and [Ungi2014]. This paper then refers to two methods of scoliosis quantification, maximum projection intensity [Chen2013] and volume projection imaging [Cheung2015], with which I am unfamiliar.

This paper also describes their contribution as an assessment of a method for using ultrasound to quantify scoliosis in a clinical application, in this case, the Scolioscan. They examine intra and inter-operator variability, and the correlation between the machine's output and the Cobb angle.

Similarly to [Ungi2014], this paper makes no claims with which I am unfamiliar, much less that I disagree with. Bones are visible in ultrasound, and 3D deformation can be extracted from spatially tracked 2D images. I should not expect to see unexpected claims in a paper evaluating the effectiveness of a new machine which uses existing technologies for the existing purpose of scoliosis quantification.

As does [Ungi2014], this paper effectively runs down the list of relevant work in the field in the Background section, making the state of the art clear. Their contribution is then easy to understand, as it is the assessment of this concrete machine. Since none of the listed references worked with this machine, the distinctness of their contribution was immediately apparent.

I will not likely return to this paper because it deals with the Scolioscan, a particular machine to which I do not have access and has no bearing on my project.

This paper is more of a 1 or a 2 out of 10 in terms of the difficulty in extracting the problem statement and the authors' contributions. The motivation (the dangers of repetitive X-raying) is stated early on, the description of the context is clear and distinct, and their contribution is obvious since none of the sources in their background deal with the Scolioscan.

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