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Journal Name:	Advances in Research
Manuscript Number:	2014_AIR_11388
Title of the Manuscript:	Crack-growth on canvas paintings during transport simulation monitored with digital holographic speckle interferometry
Type of the Article	Original Research Article

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This journal's peer review policy states that **NO** manuscript should be rejected only on the basis of '**lack of Novelty**', provided the manuscript is scientifically robust and technically sound.

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PART 1: Review Comments

This paper reports a series of experiments to investigate the vibration impact in paintings, more precisely in the generation and growth of surface cracks. The article is an interesting read and is adequate for publication. However I feel that some kind of revision is needed before publishing.

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
Compulsory REVISION comments	I had a lot of problems understanding the objective of the paper, which is a bit frustrating. The introduction states that the paper aims to record the vibration impact during the process of generation of cracks in real time, presumably to determine under which conditions it becomes a danger to the painting or to better understand how it degrades.	It is described a feasibility study with clear objective the use of full field real time monitoring of transported fragile paintings facing the aim to avoid crack generation and deterioration. Also it is well known in conservation science that investigation of surfaces in full-field is not a usual practice or commonly possible. Transportation impact becomes visible long after the rapture. Hence the obvious objective of presented methodology stands on its own. In regards to the scientific objective that is indeed the better understanding of the effects of transportation on crack growth and crack propagation the developed methodology proved more than efficient to elucidate such cumbersome events and it is described through presentation of results from a number of cycles.



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	<p>However, after reading the paper it seems that only an exponential dependency of the number of cracks with time and/or vibration acceleration is obtained. I am not sure if this result is of any importance, because I found no relation with similar studies or previous assumptions in this field. In addition results vary quite a lot from one test sample to another and too few points are used to fit the equation $y = \exp(a + bx + cx^2)$ (why this and no other exponential? Is that of any significance?) to extract any useful conclusion. I am sure all this is of importance, but I failed to understand why.</p>	<p>Indeed, no similar studies exist since there hasn't been existed a system able to perform this investigation. IR thermography implemented in the same experiments showed the cracks after they are already visible on the surface. Indeed, nobody else before has associated the crack growth with exponential growth. A new cycle of experimental study on crack growth on canvas is in progress. As in any preliminary examination lots of samples and cycles were used and the data points that can be expressed through mathematical representations are used.</p>
	<p>The discussion section is, in my opinion, poor. It fails to convey the major findings of the investigation and why they are important, and includes a very complex section which I think should not be there, just to introduce the last paragraph. Probably it is just because I found all this part quite difficult to follow.</p>	<p>Comment accepted and revised by the author.</p>
	<p>The system is supposed to work in real time, as the author's state in the introduction, but it is using a 5-frame algorithm as a basis, which requires the sample to remain static and under a controlled environment for the time it takes to obtain the 5 images. Wouldn't this be a problem for real time operation? I see that the experiments are performed so that the map is obtained *after* each vibration cycle, in a static state; thus real-time operation here is no more needed. What am I missing here?</p>	<p>Any carrier frequency algorithm that has been ever developed was to surpass the problem of static targets within laboratory conditions environment strict specifications. Capturing in full-field a high resolution image within second rate it is considered to allow monitoring in real time. This is a real time system able to recording continuously every few milliseconds a new record, since most of the monitored phenomena in art conservation diagnosis have scale differences in growth or have lower or much lower than millisecond propagation rates. This is the reason why the DHSPI has to record hundreds of images to follow defect generation and even before any defect appears and not vice versa.</p>



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		<p>The real time recording is in automatic mode. The cracks to generate the crack maps are obtained during the vibration cycle. It is the processing of interferometric data to obtain the crack map that it is performed after the end of each cycle in post processing mode.</p>
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	<p>I failed to understand the need of the first image after thermal treatment too.</p> <p>The sensor itself is not described in enough detail. I am sure that the authors have published this data in previous papers, but a quick summary would be important (including some schematics and working principle, how interference fringes are obtained, how the phase is calculated, etc.). The fact that they state that DHSPI is well-known is not enough. Only Tornari et al use this name for the technique, so it is difficult to understand the difference with Digital Holography or conventional ESPI methods.</p>	<p>It is registering the reference state of the surface before the cycle.</p> <p>Ok I added two references on the system. Indeed though, only Tornari et al can use it because they developed and belong the system.</p> <p>The technique and sensor are briefly described in this paper in an effort to avoid unnecessary long technical details. Schematics and working principle or capturing of interference fringes etc as the reviewer suggest are all considered as irrelevant details in regards to the aim of the paper. However the information is widely available in other papers and for the interest readers a long list of references is given.</p> <p>Reviewer unfolds confusion in names often observed. So I explain, DHSPI is an instrument of coherent metrology, not the name of a technique. DHSPI is indeed a well known system developed especially for out-of-lab art diagnostic applications, combines several advantages and omits other in the name of portability. Dhspi system developed at authors' laboratory is based on the wave-physics laws and the optical properties and principles of holographic and speckle field produced interferometry.</p> <p>DHSPI is not ESPI or digital holography or HINDT but a combination of advantages. Capturing interference speckle patterns has been given many different names over the last decades, as Tv Holography, Electronic Speckle Pattern Interferometry, Digital Speckle Pattern Interferometry, Fiber Optics Digital Speckle Pattern Interferometry etc.</p> <p>DHSPI is as the acronym accurately suggests a</p>
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		numerical registration from D igital capturing of H olographic modulated S peckle P attern field produced by interference formation via an I nterferometry system.
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<u>Minor</u> REVISION comments	<p>A deep revision of the grammar, style and general writing is needed. Some sections and paragraphs are obscure and difficult to understand. I found most problems in the description of the samples and the methodology, for instance lines 183-190.</p> <p>There are other style issues such as the citation [16] at line 42, which I am not sure why it is there.</p> <p>I had problems with some figures, missing the arrows or overlapping with some text (fig 9) or poor resolution (fig 10, for instance). Maybe it is my copy of the PDF, though.</p>	Ok thanks for the comments. I hope is clearer now.
<u>Optional/General</u> comments	<p>The authors have made an excellent work with the design of the simulator and the making of the samples. They seem to use a quite novel technology, though they don't explain well how it works or its benefits when compared to other similar techniques. Their study seems to be of interest and a lot of work has been put in this investigation. In my opinion they should clarify the objectives and the major findings better to help the reader understand the relevance of their research.</p> <p>I really think clarifying the above points would improve this article a lot.</p>	Thank you for your suggestions.