3D VIEW SYNTHESIS WITH INTER-VIEW CONSISTENCY

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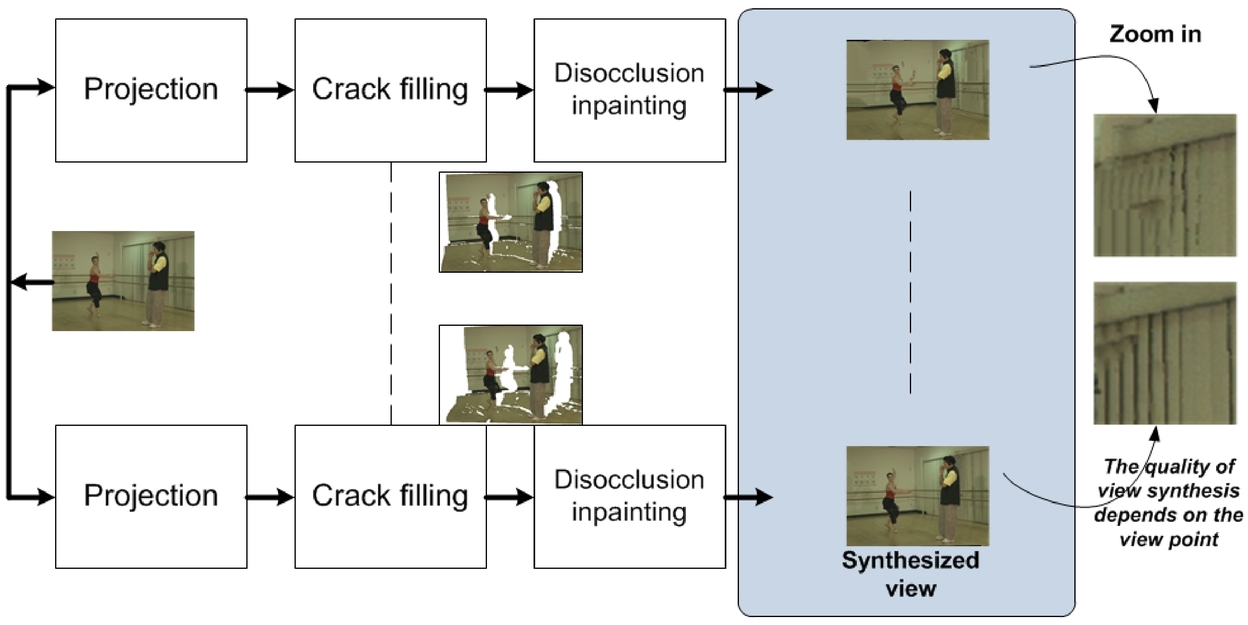
Motivation: extrapolate views from a single viewpoint (texture +depth) for 3DTV/FTV applications…

Classical approach to synthesize virtual views



Issue 1:
Foreground/background differentiation to prevent the use of foreground information to fill in disocclusions

Issue 2:
Due to the projection and crack filling, the data used by the inpainting could present severe artifacts.

Issue 3:
Inpainting is applied several times which leads to a lack of consistency between virtual views synthesized from the same reference view.

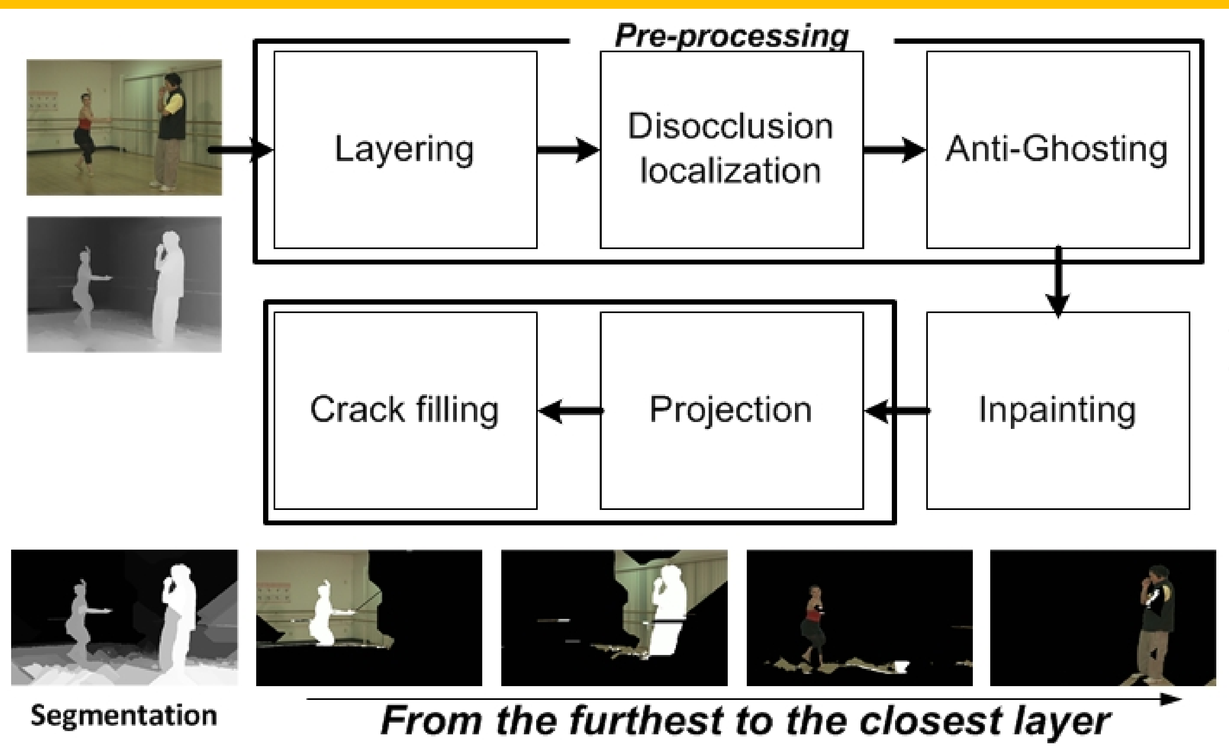
Issue 4:
Inpainting is done separately for each view. This introduces inconsistencies and this is redundant/time consuming.

Proposition: a new framework to synthesize virtual views providing inter-view consistency

Edge-based segmentation:
We look for pixels which are separated by a disocclusion when they are projected into extreme virtual views.

Are two neighbors still neighbors after projection?

Layering:
It aims to regroup into layers the regions that do not share any disocclusion and that are close in terms of depth.



Inpainting:
We use an examplar-based inpainting method using the depth map [1][3].

Projection and crack filling:

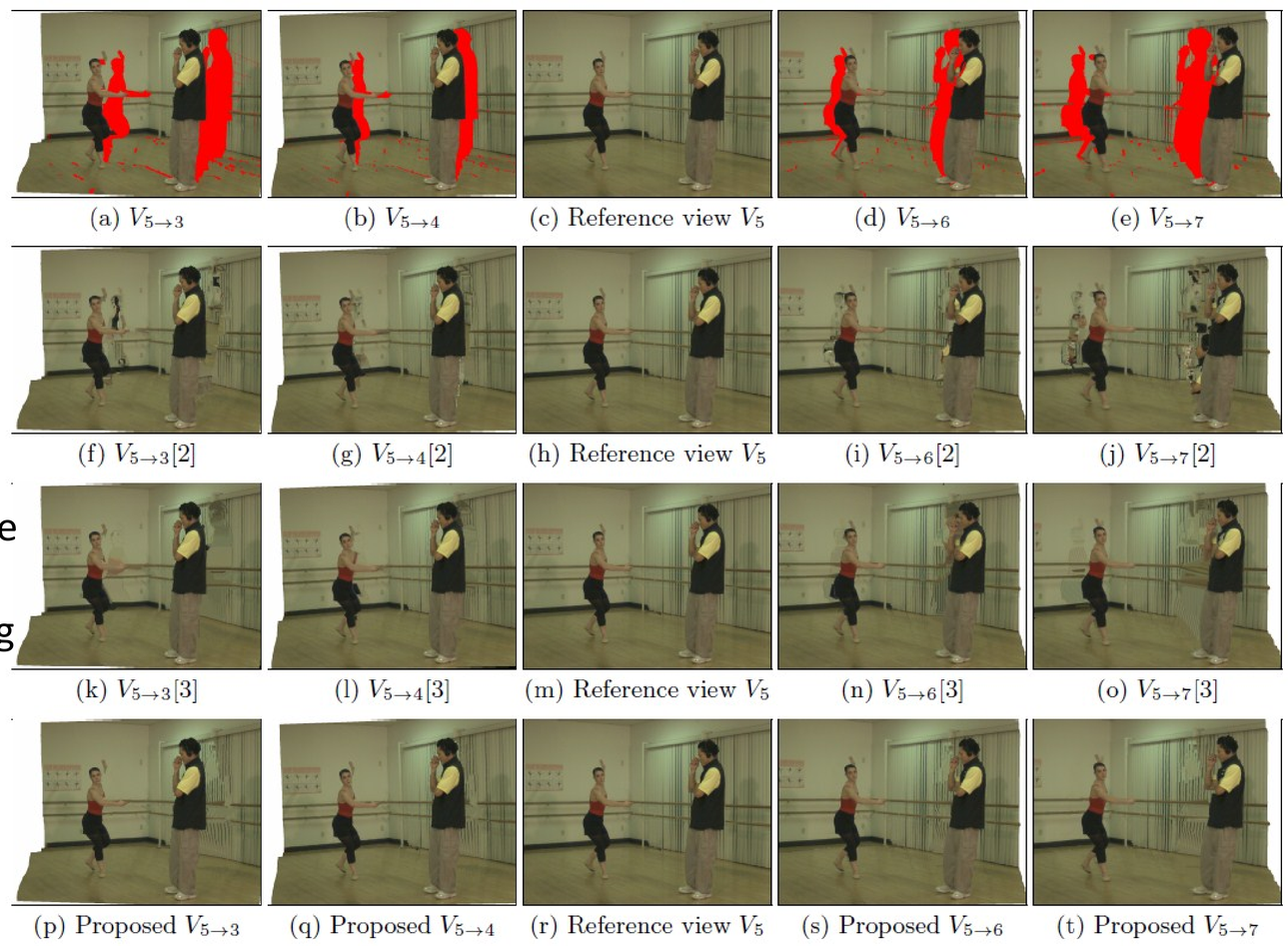
Algorithm : Projection and crack-filling.

```
foreach virtual view do
    viewImage := unknown pixels
    foreach layer closest to furthest do
        project layer
        remove cracks in layer
        foreach known pixel in layer do
            if pixel is unknown in viewImage then
                copy pixel to viewImage;
            end
        end
        remove cracks in viewImage
    end
end
```

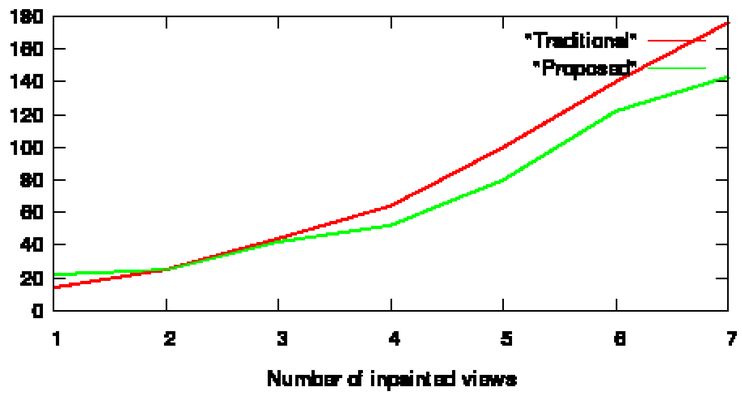
Disocclusions can only appear between layers and not inside any single layer…

Results and performance

Evaluation:
- Ballet and BreakDancers composed of 8 views;
- Reference view 5 and 3 respectively;
- Project the reference view into other camera viewpoints and check the quality;
- Comparison with existing methods [2][3].



Execution times (s) for traditional and proposed framework



When the number of synthesized views increases, the proposed approach clearly outperforms method [3] in terms of computational load.

Conclusions

Conclusion 1:
Better quality during the navigation is achieved.

Conclusion 2:
Inter-view consistency is obtained thanks to the proposed approach

Conclusion 3:
Computational time is reduced

Software / materials / video

http://people.irisa.fr/Olivier.Le_Meur/

[1] A. Criminisi, P. Pérez, and K. Toyama. Region filling and object removal by exemplar-based image inpainting. IEEE TIP, 13:1200-1212, 2004.
[2] I. Daribo and B. Pesquet-Popescu. Depth-aided image inpainting for novel view synthesis. In Multimedia Signal Processing (MMSP), pages 167-170, 2010.
[3] J. Gautier, O. Le Meur, and C. Guillemot. Depth-based image completion for view synthesis. In 3DTV Conference, 2011.

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