highlighted in previous work [7]. The previous conclusion has been that KDWP in JPEG2000 are only suitable for the application scenario of transparent encryption.

In this work we pose a new question, can an attacker go further and decode subsequent resolutions, i.e., images with an higher quality than targeted. In fact resolution only loosely corresponds to perceived quality, but as every subsequent improvement an attacker can achieve (by image enhancement operations) starts from a previously deciphered lower resolution it makes sense to use resolution as sole quality indicator within the scope of this work. The quality of an attacked image is determined as the fraction of original resolution divided by the obtained resolution (given in the number of pixels).

Thus the attacker’s problem is: Given access to a resolution image how hard is it to obtain / decode the next resolution? Figure 7 illustrates the problem for isotropic and anisotropic decompositions. Therefore, we first need to answer whether the next resolution can be decoded from the codestream (independently of the higher resolutions). This is the case in the coding framework of JPEG2000. A resolution can be decoded independently from the remaining higher resolutions (definitely for resolution progression and at least at the lowest quality for layer progression and always if SOP and EPH markers are employed which signal packet borders).

The next question is whether it is decidable that the employed subband decomposition structure is the correct one. It is also highly likely that it can be decided whether the correct decomposition structure has been employed in the decoding of a resolution: Firstly, the wavelet resolutions are not independent, i.e., statistical cross-resolution dependencies are highly likely to identify the correct decomposition. Secondly, the codestream syntax and semantics must also be met while decoding with a subband decomposition structure, i.e., decoding errors clearly indicate an incorrect decomposition structure.

Thus the decomposition structure of a resolution can be determined independently of the higher resolutions in JPEG2000.

Now, how hard is it for an adversary to decode a certain resolution? We first discuss the standardized case of JPEG2000 Part 2.

![Fig. 7 Attack against a subsequent resolution](image-url)