

own identity called obfuscation [12]. It consists of 968 videos with 13 different types of spoofs and 680 videos of 493 live subjects with addition in ethnicity and age to increase diversity. Some samples of SiW-M can be seen in Fig. 8.

5) *OULU-NPU Database*: Introduced as OULU-NPU [10], a face PAD database has developed to evaluate the generalization of face anti-spoof technique in real case scenarios to increase diversity so the trained algorithm can be implemented in real life. It consists of videos with an unknown environment which is three different illumination and background areas. The videos are recorded using six different smartphone front cameras with two types of spoofs: prints attack and videos attack. The database consists of 5,940 videos and 55 subjects. Some samples of OULU-NPU can be seen in Fig. 9. Table II shows the comparison of complexity between the database in each study.

V. CONCLUSION

Spoofing attacks have been proved to be a significant threat for face biometric systems. Thus, researchers have proposed various anti-spoofing methods. Despite the trend in better generalization with various spoofs, most research does not calculate or show whether certain aspects, such as the system, run with high computational and storage costs or not. Therefore, most of the methods still have limitations for real-case applications. However, many researchers have searched for further development in many fusion methods and created diverse databases. Each development makes a transition to fill the gap between academic purpose to real-case application. This paper presents an overview of face spoof and recent development in spoofing methods and datasets, which can be used for future research.

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