Voice signal features analysis and classification through a mobile cloud-based system for early voice diseases detection

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Dysphonia is one of the major symptoms of benign laryngeal diseases and other functional and neurological pathologies. Moreover, many common voice disorders are chronic or result from abusive pattern of vocal behaviour. Nowadays, wide diffusion of mobile and/or portable technologies allows collecting vocal data easily and in real time, guaranteeing an early monitoring of voice status. The proposed solutions do not give medical feedback or advice, but show and track only the fundamental acoustic parameters.
We start from our previously published experiences where a web-based application has been developed and tested. We here present a cloud-based system for early detection of voice related pathologies. The user creates an account and is then able to interact with the remote system through a mobile client to request an analysis of his/her vocal registration. The user is able to send a voice recording to server through his/her smartphone. By server-side, the data are stored and analysed. Well-known acoustic parameters, such as fundamental frequency and noise indexes, are extracted and classified to early recognize pathological voices. At the end of the analysis, the server notifies to user that a report is available; this report contains the result of analysis as indication about the possibility of pathologies of the larynx or the vocal tract. If necessary, the system suggests carrying out an accurate voice control by a specialist. The proposed system has been validated on a dataset that include 208 female (126 healthy and 82 ill) and 166 male (118 healthy and 48 ill). Classification algorithm shows high True Positive Rate and low False Positive Rate values, with classification accuracy between 0.7 and 0.8 on average.
The proposed system would not replace the specialist or make a diagnosis, but it represents a support to alert a potentially affected patient to follow a detailed visit, eliminating the discomfort due to time and/or distance constraints from the specialist.