# Social Signal Analysis in Criminal Mediation Processes

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## Problem definition

In the courts of the *Generalitat* of Catalonia, the criminal mediation processes are common acts for justice purposes. These processes are performed with the main goal of helping both parts involved in an offense to reach an agreement, where the victim can feel partially recompensed and the imputed has the opportunity to apologize and mitigate the associated conviction. A key point in these processes is the role of the mediator, who has the objective of obtaining such agreement that can benefit both parts. In order to achieve this agreement, it is common to perform a set of sessions during several months, sometimes just with one of the parts, and taking into account the considerations of the mediator about that the agreement is possible. Given that the success of a penal mediation is considered as a positive reward to the victim and can help the condemned to allow his earlier social reintegration, it is quite desirable to reach that agreement.

Unfortunately, this agreement is not always guaranteed. In this sense, it is of our interest to perform a psychological-methodological study in order to automatically analyze the behavior of the parts involved in the mediation process, where it can then be used to detect their social signals. In the behavioral sense, these social signals are those patterns that appear during the sessions having a high correlation with the success and/or failure of the mediation. This automatic behavior analysis can then be used by the mediator in order to self-analyze his/her behavior during the process and the effect of their social signals in relation to the final agreement, providing a feedback of his/her professional skills. Moreover, the automatic detection of the patterns that correlates the success and failure of the process can be used by the mediator in order to include the required mechanisms to guide the process towards the desired agreement.

The high dependence of these 'states of success' for the conversational processes -or in many other social contexts- with the socials signals have been very analyzed in several works [1].
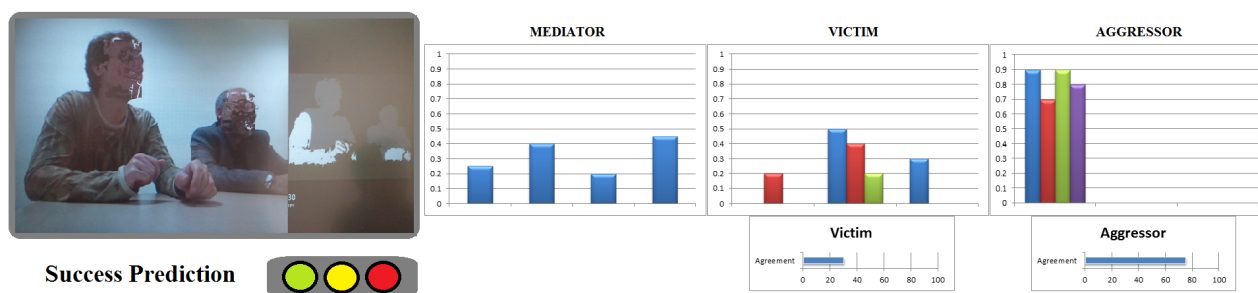


Figure 1: Example of graphical representation of the system's functionality. On the left an example of RGB-D captured data of a mediation session. On the right the bar plots with the indicator values and probabilities of agreement.

## Proposal

At this time, we are currently collaborating with the Justice Department from the *Generalitat* of Catalonia in order to perform a technical multi-disciplinary methodology to capture multi-modal data from mediation sessions of different courts and penitentiary centers of the Catalan region. More than 20 sessions have been

recorded at this moment including the mediators, victims, and imputed using multi-modal RGB-Depth data from the Kinect$^{TM}$ device. For each mediation session, both the RGB-Depth and sound sources from multiple Kinect$^{TM}$ devices are synchronized, in order to record the behavior information from all persons involved in the mediation process, who previously have signed the required consent forms covering all associated ethical and security issues.

Our current work is focused on the automatic analysis of behavior cues using feature extraction from RGB-D data, limb detection, and temporal analysis using dynamic programming and probabilistic methods. The described data will be used to train a set of discriminative classifiers that will perform feature selection to detect those features that better split the success and failure mediations based on the ground truth defined by the mediators. This ground truth is obtained by the questionnaires that are filled by the mediator at the end of each session, describing the engagement, stress, and activity behaviors, among others, of the involved parts during the process. In Figure 1 we show an example of the actual interface and the expected results at the end of the automated process.

### Discussion

Automatic analysis of human behavior is a hard task by itself due to the high amount of subjective information that one can consider -specially psychologists or other experts in the area of observational methodology-. However, as we deal with quantitative indicators described and used in many social contexts [1], we can guide this process towards an objective evaluation of these social signals, obtaining confident values for predicting the success of the mediation process.

Gesture sequences from recorded people in the data is the most significative information to perform an analysis of the non-verbal communication. In this way, we need to deal with such sequence processing in order to detect and analyze the fragments containing a gesture composed by a certain defined vocabulary. For this purpose, we are planning to use different temporal clustering techniques such as [2], and hence a proper discretization in order to learn and define our vocabulary. In the future, other information contained in our data such as the speech can be also analyzed as signals from the audio in order to integrate it in a full framework for behavior analysis in conversational situations.

### Acknowledgements

# References

[1] Alex (Sandy) Pentland. "Honest Signals: How They Shape Our World" *Book*, The MIT Press; First Edition, 2008

[2] F. Zhou, F. D. la Torre, and J. K. Hodgins. "Hierarchical Aligned Cluster Analysis for Temporal Clustering of Human Motion. *Journal*, IEEE Journal TPAMI, 2011.