Working with SynTouch and the BioTac Toccare

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The BioTac Toccare™ carefully recreates the same interaction as the human hand touching a material. As a result, it can acquire data that mimics human perception of touch. The measurements of material tested are the fifteen dimensions of touch – The SynTouch Standard®. Some customers are satisfied to work with these values, akin to having the ‘RGB’ values, but for touch. Others require a more nuanced analysis of their results compared to their existing human testing data, analogous to understanding what constitutes a ‘favorite color’. Bridging from our measurements to the answer to your problems requires that we define what information you have available and what form you would like to have your answer provided.

Once we understand your application for the BioTac Toccare we review the human testing data that you have available for samples:

**Qualitative Descriptions:**
- Denoted ‘best,’ and ‘worst’ due to their overall tactile impression.
- Which have the ‘most’ and ‘least’ of the attributes you desire.
- Described via free-text association by reviewers.

**Quantitative Assessments:**
- Ranked by order of preference: first, second, third, etc.
- With human-based dimension measurements, i.e. ‘Softness values’ of 13, 15 25, etc.

**No Available Human Testing Data**
- If you do not have human testing data we can provide you with full-service options to acquire it.

We also review your desired outcome from our testing. Three categories for analysis are:

- **Similarity scores that compare how closely new samples feel to an ideal specimen.**
- **Grades for samples feeling ‘best’ to ‘worst’ on a scale unique to your materials.**
- **The measurement that correlates with an internally used dimension name, i.e., ‘Soft.’**

If you purchase or rent a BioTac Toccare, we will coordinate these reviews and evaluations to happen before or during your installation period. If you are opting for services, this can happen independently of the future purchase of your BioTac Toccare. In either case SynTouch will safeguard your confidential data results - the bespoke data processing we develop is for your exclusive use and convenience. Due to the combinations of material type, industry, human testing data, and desired results, there are myriad possible configurations for these studies which are best discussed in person. As a conceptual framework one example of this process is outlined below.

Say you are at an automotive OEM building a next-generation automobile interior. The head interior designer has specified a material as the ‘best’ leather for seats – a luxurious full-grain sample - that you simply can’t buy at the price you need. You’ve sourced a few inexpensive alternatives which your suppliers say feel closest to the sample you’re trying to match, but they don’t exactly feel the same. Both the head of interior design and your charismatic design-oriented CEO were able to blindly evaluate and rank the samples, and consistently preferred the full-grain sample as their ‘number one’ choice, and the others in a fairly consistent decreasing rank. Clearly, they have a preference for some feel in the samples. Your CEO described how they vary in how ‘lux’ they feel, and while you get what he means in principle, nobody at your company can define what it means in terms that you can quantify, specify and use to guide design. For your CEO, ‘lux’ seems to be some combination of softness, smoothness, and warmth, but that’s too vague for your needs.

- Discuss your products and need for testing.
- Share your human-based material evaluations.
- Send samples of your materials.
- Test your materials.
- Share testing results and custom analysis.
- Provide ongoing testing as a service, or deliver your own BioTac Toccare.
When you come to SynTouch we talk to you about your application and ask you about your current problem. SynTouch will sign your NDA so you can send us material examples and your existing data for screening. Screening your materials allows us to touch samples of your leathers and determine if any unknowns to resolve before testing. Fortunately, we’ve worked with many samples like this and can test your leathers. Your data allows us to understand what your current situation: you have qualitative descriptions (one sample is denoted ‘best’). You also have quantitative assessments (candidate samples are ranked first, second, third, etc.). You do not have human-based dimension measurements, i.e. ‘lux values’ are not rated for each sample.

You indicated on our calls that what you wanted was to know how close samples would be to that ‘ideal’ leather, i.e. you asked for us to quantify how closely alternative synthetic leathers match your preferred sample.

With your samples now tested we determined that a few additional leather samples from our own materials library to help flesh out the data used to solve your problem. We shipped SynTouch’s leather samples to you to have your CEO evaluate these on the same scale – i.e. to rate his preference for each. Using this expanded human-testing data connected to each samples we now combine our testing results and your human-testing data.

With your ranked samples, we can evaluate the psychophysics that your CEO is applying to the leathers. The information that any given sensory specialist uses to judge how something feels is slightly different, which leads to differing opinions what the ‘best’ values are for each of the fifteen dimensions of touch. Some people have their main preference for leather driven by our adhesive dimension for leather: values that are too high are perceived to be artificial leather. Other people notice the subtle variations in texture: macrotexture regularity plays a critical role in differentiating between artificial leathers which often have a repeated pattern and natural leathers which are always unique. We performed regressions of the BioTac Toccare data and your custom grading data to begin understanding what we need to include in your metrics to compute how perceptually far away a sample is from your CEO’s favorite sample. We noted that the

We found that the dimensions of adhesion and macrotexture regularity both drive the majority of correlation to ‘lux’. For adhesion, the synthetic leather alternatives that were graded had both higher and lower adhesion than the ideal sample. For macrotexture regularity, we find your CEO consistently preferred samples with lower regularity. We complied this information and give you a report specifying that within the range of materials considered, that your CEO has a strong preference for low macrotexture regularity, and a specific range of adhesion values.

We also compute a bespoke metric using these two dimensions and provide you with an objective measurement of ‘lux’. You can readily validate our metric by testing additional samples and verifying that your CEO and your bespoke algorithm indicated the same rank order. You can also have your CEO evaluate the macrotexture regularity and the adhesion levels of the various samples, and compare that to the appropriate SynTouch Standard Dimensions (Figure 4) to enable him to see what was driving his preferences.

From now on, any samples we test for you can have this bespoke ranking algorithm applied and you can calculate how far away from the ideal leather each will be perceived by your CEO. You can also rank order each new synthetic leather candidate based on this algorithm and use it to match your CEO's preferences. In other words, you have a tool to steer the development of new samples by your suppliers - the leather samples which are closest to the ideal can have their adhesive, macrotexture regularity, and thermal properties adjusted by the providers to come closer to the ideal sample.

You can now go back to your CEO and say that you can capture their preferred feel, objectively quantify it, and transmit the needed information so your suppliers can adjust their leathers to attempt to match the preference. If you like, you can also purchase of your own BioTac Toccare. We include your bespoke algorithm in your testing instrument, allowing you to capture this custom measurement in-house, and verify how closely they maintain their production runs to the samples they give you – ensuring that you have an objective measurement equivalent to your CEO personally testing every incoming batch of materials.

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