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Determining the Difference Between Counterfeit & Luxury Products

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Abstract

Counterfeits have affected the global industry for decades accumulating billions of dollars in revenue. A study done at the end of 2017 indicates the counterfeit industry has reached $1.2 trillion and is estimated to reach $1.82 trillion by the end of 2020. Counterfeit goods have many ways to reach the final consumer including flea markets, liquidation sales, street vendors, illicit storefronts, and legitimate businesses, as well as online retailers. For this creative project, I created a counterfeit Kate Spade dress to determine the differences visible on the streets compared to an online setting. The results of this study warrant further research into the alternative detection methods.

Keywords: Counterfeit, knockoff, multispectral imaging, luxury

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I would also like to extend a thank you to the College of Engineering at the University of Arkansas. The engineering college will be resuming this study in the Spring 2019 semester as they continue to develop the software for the multispectral imaging camera.

Introduction

In 1984 the World Customs Organization (WCO) estimated that the counterfeit industry was worth $5.5 billion. As of 2007, the industry accounted for $512 billion, which converts to 7% of the world trade. To put it into perspective, if the counterfeit industry was acknowledged as a business in 2007, it would have been twice as big as Walmart, the largest retailer in the world (Phillips, 2007). A study done at the end of 2017 indicated the counterfeit industry had reached $1.2 trillion and was estimated to reach $1.82 trillion by the end of 2020 (AP News, 2018).

Counterfeits have affected the global industry for decades accumulating billions of dollars in revenue (AP News, 2018). A counterfeit is a product specifically made with the intent to deceive a consumer (Merriam-Webster Dictionary, n.d.). Counterfeits are illegal and passed off as the genuine brand. A counterfeit differs from a knockoff in that a knockoff is a copy of the original, made in a cheaper quality, and sold for less. A knockoff is not sold as the genuine brand, but is legally branded by the company selling it (Merriam-Webster Dictionary, n.d.).

As of 2016, the average U.S. citizen spent more than $1,800 on apparel and services annually (U.S. Bureau of Labor and Statistics, 2016); counterfeiting threatens the economy by shrinking the sales of authorized retailers (U.S. Immigration and Customs Enforcement, 2011). According to the U.S. Customs and Border Protection (CBP), in the fiscal year of 2016 the CBP along with Immigration and Customs Enforcement (ICE) seized 31,560 goods, a 9% increase from the year before. If the goods had been authentic, the estimated total retail value of all seized goods would have been over $1.38 billion (U.S. Customs and Border Protection, 2017).

The Organization for Economic Co-operation and Development (OECD) found that the United States is affected the most by counterfeits based on the total value of seizures. The OECD found China responsible for 63.2% of the fake goods seized by other countries. Even though

many counterfeit producers find weaker entry points, 62% of seizures come through postal parcels (OECD, 2016).

While there are ways to identify counterfeit goods, many lack sophistication or are accomplished by destroying the products. With the exception of authentication numbers, the methods rely on price points, fabrication, and construction to spot a counterfeit (Kelleher, 2006). For fabrication of an authentic products, the material should be exceptional and the logo should never run into the stitching or seams of a bag. Luxury bags are staple items and often come in neutrals or very limited colors. However, with counterfeits, one can obtain a "luxury" product in a variety of colors, which should almost automatically allow one to determine it is a counterfeit (Frerichs, 2008). Last, and most important, the price of a counterfeit is often much lower. Designers almost never discount their products, so to find a bag being sold at lower than retail value or on sale means it is more than likely counterfeited. (Yao, 2006).

In addition to the money counterfeiters save using cheaper materials, they also save money on advertising and marketing their products as they are already well known by consumers or the original company is already putting forth marketing efforts for their own genuine products. Another way they cut corners is by posting products to websites such as Facebook, Craigslist, or eBay for free, which reduces the cost of website fees and dues. By posting on marketplaces, counterfeiters can obtain higher profit margins due to the bidding features on many of these websites. (Levy, 2016).

The purpose of this thesis is to create a counterfeit garment for the testing of multispectral imaging equipment. The following objectives were created to meet this purpose:

1. Determine the differences regarding the components of a luxury item and a counterfeit
2. Determine the current systems used to detect counterfeit goods

3. Describe the impact counterfeits have on the luxury industry
4. Determine new ways to detect a counterfeit product

Literature Review

Selling & Manufacturing

The counterfeit industry is made up of two different markets. The primary market consists of consumers who believe they are purchasing a genuine product or garment when in reality they are buying a counterfeit. The secondary market is made up of the consumers who are truly out to buy a counterfeit product. With the number of counterfeits increasing, different policies have been passed and implemented for each market as well as measure to protect a consumer (Barnier, 2017).

Counterfeit goods have many ways to reach the final consumer including flea markets, liquidation sales, street vendors, illicit storefronts, and legitimate businesses, as well as online (Wilson & Fenoff, 2014). Fraudulent products are most often manufactured in China, South Korea, Taiwan, or South America (Juggessur, 2011). Seized goods from China totaled $87.3 million in 2003, and Russian goods were in second place with $7.3 million. To put it into perspective, China accounted for 63% of the total dollar amount seized for the year, with Russia's second place accounting for only 5% of the total (Tucker & Derby, 2005).

Globalization of the economy has made it possible for a counterfeiter to send their pirated goods to almost any country by shipping them through customs. A lot of counterfeit goods pass through customs due to the large flow of materials entering and exiting the ports. Specifically, for the US, inspectors are only able to look at about 5% of the goods entering the country (Paradise, 1999).

With online shopping, a consumer cannot be absolutely sure they are buying a legitimate good. Vendors can create websites that appear legitimate using the company's logo and marketing. Recently, distributors have been selling counterfeit products close to the original price, which leads an online shopper to believe they are buying a genuine product (Timpone, 2017). In 2012, U.S. Immigration and Customs Enforcement issued announced the seizures of many fake websites that were closely designed to the original company's website (Wilson & Fenoff, 2014).

If buying a counterfeit on the street, one looks through a catalog or a suitcase to pick the item they want. In addition to street vendors, online markets are able to consider consumer location and a variety of assortments. Due to such more options, more than 70% of counterfeits are purchased in an online marketplace. Purchasing online creates an easy environment for shoppers, as there are more options available to them through many more vendors. Even credible sources, such as Amazon, are having a hard time keeping counterfeits off of their site. Even though Amazon Prime is a more secure site for consumers, counterfeit items can still end up with an authentic checkmark next to them. In 2017, Chanel sued 24 Amazon sellers for selling counterfeits as original products (Mooij, 2017)

Current Methods & Data

With counterfeits spiraling out of control, many detection methods are available, such as holograms, barcodes, specially manufactured paper, and types of ink, which all have limitations or can cause damage to the products. Holograms are a fairly new practice and are currently a good way to create a barrier for counterfeits. Unfortunately they can eventually be replicated. By using a manufactured paper or an ink, one can fairly easily detect a counterfeit garment,

however, they risk ruining a garment or product due to the use of such methods (Sharma, Srinivasan, Kanchan, & Subramanian, 2017).

Knowing this information, a team from New York University developed a new mechanism that uses algorithms to distinguish counterfeit products from the genuine ones. The detection system produces three million images across multiple objects/materials, and is over 98% accurate without destroying the products. The limitation to this method is the complication of capturing high quality microscopic images consistently due to the limited field of view (Sharma, Srinivasan, Kanchan, & Subramanian, 2017).

Federal Agencies

Multiple legal structures attempt to protect intellectual property. The most well-known global organizations are the World Intellectual Property Organization (WIPO) created in 1967 and the World Trade Organization (WTO) established in 1995. Agencies that protect the U.S. specifically are the U.S. Immigration and Custom Enforcement (ICE) and U.S. Customs and Border Protection (CBP), both of which were established in 2003. Along with the addition of agencies, the Anti-Counterfeiting Trade Agreement (ACTA) was signed in 2011 to create new global standards for intellectual property enforcement (Timpone, 2017). Governments are beginning to see the effect of counterfeit trade as it creates a loss of billions of tax dollars; so, with that officials are starting to work closely with vendors and major fashion houses (Tucker & Derby, 2005).

Multispectral Imaging Studies

Previous studies have used multispectral imaging to detect counterfeit currency and drug paraphernalia. With the same problem as apparel/fashion, the methods to identify counterfeits in these two industries are unreliable and lack sophistication. Unfortunately, even if brands

continue to create new ways to keep their products from being counterfeited, those methods will eventually be perfected by counterfeiters to be passed off as the original and genuine product (Pradeep, 2017).

Although few studies have been completed, the majority of multispectral imaging research projects are conducted in similar ways. White references are scanned, followed by a black reference, and then the raw image of the product. The denomination is identified through the white reference, which creates a sturdy base for comparison with both the black reference and the raw images. The multispectral imaging method has proven to be one of the fastest detection methods with accurate results for counterfeits among many different industries. (Pradeep, 2017).

Development Plan

The College of Engineering at the University of Arkansas will be working closely with this project as they have purchased the multispectral imaging camera that will later be used to test the fabric used for this garment. To detect counterfeits, multispectral imaging will be used for quick, accurate testing. The imaging measures color, texture, gloss, shape, and size by utilizing RGB coloring, multiple wavelengths of light, and polarization to produce different, yet complementary images. The RGB color model is an additive model in that red, green, and blue are added together in various ways to create a range of different colors, all holding a different value. Without any harm to the apparel product, the imaging might automatically detect a counterfeit through the multiple images it produces. Multispectral imaging has the potential to be an important tool for government officials, as they are typically the front line of the seizures. This technology is high-performing and inexpensive way to detect counterfeits.

The multispectral imaging method is starting to be used more frequently as other counterfeit detection applications and methods were not as sufficient and accurate. Multispectral imaging offers a rapid solution as well as a portable detection system due to the size of the actual camera. Using up to 20 different wavelengths, subtle changes are flagged and reported in 10 seconds or less. Although it may be difficult to detect a counterfeit using the naked eye, the use of specialized inks and texture effects allows for simple and easy identification.

Materials & Design Process

Materials

For this study, a designer Kate Spade dress will be replicated using a fabric of similar pattern and composition. In order to obtain accurate results, the material must be of the same fabrication and weight. The Kate Spade dress is made of 100% polyester crepe. The fabric is navy with 0.5" wide white "cloud" dots. After extensively searching for a similar material, a navy blue 100% polyester crepe fabric with 1" white polka dots was found.

Along with the original dress and fabric, a list of sewing notions were needed:

- Sewing machine
- Serger machine
- Bobbin
- Matching thread
- ¼" wide elastic
- Buttons
- Tracing paper
- Tracing wheel
- Pencil
- Scissors
- Pins
- Ruler
- Chalk
- Seam ripper
- Iron

Using the Camera

In future research, the Kate Spade dress, along with a swatch of replicated fabric, will be taken to the College of Engineering to begin the imaging process. The first program needed is the scanning application. The program requires a white reference and a dark reference to be

recorded for accurate results. For best results, the white reference is a piece of paper sent by the company designing the camera, and the black reference is recorded by scanning images with the camera cap on. After both have been recorded, it is now time to capture the raw images. To achieve accurate results, the fabric must be on a diverse background, so newspapers will be placed under the fabric. After capturing images from the white reference, black reference, and raw, the images can then be made into a cube.

The imaging strips are saved into a file which can later be uploaded to the second program to begin the cube making process. The white and black references are set to take 100 imaging strips and the raw imaging is set to take 1,500 imaging strips. The raw image strips are later made into the cube.

The software used for multispectral imaging cube creation has yet to be finished, but once completed, the College of Engineering will then be able to take the image strips and put them together to create a cube using a cube creator program. A third program then reads the data and interprets the images using basic equations and histograms.

Garment Construction Process

To start the construction of the garment, the pieces must first be cut out. An easy way to determine the pieces needed is to take apart the garment, but this dress was a loan so tracing the pieces was preferable. Each piece of the dress was laid over and drawn on to tracing paper using a tracing wheel. In the end, this dress needed nine pattern pieces: bodice front, bodice back, skirt back, skirt side panel, skirt front, collar stand, collar, and button bands (2) (Appendix A, Figure 1-9).

Before any sewing took place, the pieces were serged to finish the raw edges, preventing any raveling of the fabric during or after the construction process. The Kate Spade dress has a

smocked back, an embroidery technique used to gather fabric that can stretch, which became the starting point of this project. To achieve this look on the replicated garment, multiple strips of elastic were sewn into it. In order to create a perfect fit, the pieces of elastic were measured around the back of a size 12 mannequin at a relaxed state, and were then respectively placed on the back piece of the garment. Before sewing in the elastic, chalk lines were drawn horizontally across the back piece of fabric 0.625" apart to ensure equal distance between each piece of elastic and accurate replication of the original dress. To sew in the pieces, both ends were pinned down on their respective lines, with one to three pins throughout the middle depending on the length of elastic being sewn in to the back piece. The smocking was achieved by stretching the elastic to fit the full length of fabric while sewing down the middle of the strips. After releasing the elastic, the fabric scrunched up creating the desired effect of the original garment. After all pieces were assembled, the bodice front, button band, and collar were all sewn on to the garment.

For the bodice front, sewing in the bust dart is the only step before attaching it to the other pieces. To sew on the button band, the right side of the band is placed on the right side of the bodice front and sewn at a half inch seam allowance. After doing so, the band was rolled to the back leaving the desired width for the buttons. By leaving a little fabric laying over the existing seam line, the backside of the button band can be sewn to the body front by going back through the seam line previously made. The same steps were repeated to attach a button band to the other side of the bodice front. Buttonholes were then sewn onto to the right side of the garment and buttons were added on the left. Before attaching the collar, the bodice back and front were sewn together by placing right sides together, sewing up both sides and shoulder seams.

The last step to the bodice is sewing the collar and collar stand together and then to the shirt. Starting with the collar, the longest side of the collar is sewn right sides together and straight across. Then after sewing the short widths together, the collar was flipped correct side out and pressed. To sew on the stand, the right sides of the fabric were placed together and the inside curve was sewn. The bottom length of the collar was placed inside the stand, sewn along the existing seam and then attached to the neck of the shirt.

The skirt of the dress has four panels: two sides, a front and a back. To create the skirt, the two side panels were sewn to the front by placing right sides together and simply stitching up the sides. The same steps were taken to sew the side panels to the back piece of the skirt to create the completed circle of the skirt. The bodice and skirt were then placed right sides together by turning the bodice inside out and placing it around the top of the skirt aligning the edges. The top is then sewn to the bottom, turned the right side out, and pressed. For finishing touches, the skirt is turned and stitched to hem the raw edge, and the armholes are finished with a bias binding using the fabric from the dress.

Results & Discussion

The purpose of this project was to replicate a dress and then determine the differences with the naked eye as well as the multispectral camera. The fabric will be tested in the spring semester of 2019 by the College of Engineering at the University of Arkansas to determine the different RGB values of the fabrics. This will then note the differences seen by the camera images to what can be seen and detected by the naked eye.

Determining the differences with the naked eye is not overly challenging for this project due to the fabric used. The fabric of the Kate Spade dress was a navy 100% polyester crepe and had ½" white "cloud" shaped polka dots as described on the Kate Spade website. Because this

specific fabric was difficult to find online, a navy blue 100% polyester crepe with white 1" circle polka dots was used instead. Aside from the polka dot shape and size, the fabric was similar in weight, fabrication, and color to the naked eye. By having the same qualities the dresses have the same texture and hang in the same way on the body.

The original has a smocked back that was created through elastic thread that needed to be replicated. For convenience purposes, elastic strips were sewn into the counterfeit to create the same effect for a cheaper and faster method. Using the same fabric as the outside/shell of the dress, the original was lined throughout the bodice front. The counterfeit dress was not lined for the purpose of time, but cannot be noticed when placed on a mannequin.

The most effective technique was not used in the creation of the garment as tracing was a more convenient approach. A more accurate finished project could have been produced if the original dress could have been taken apart for the creation of the individual pattern pieces.

Conclusions & Implications

While difference are not seen in pictures, the lack of quality can be felt by hand. Without having any labels or care instructions, this can easily be distinguished from a genuine product, but nearly all counterfeits on the street or online will have correctly labeled tags on the garments or products. Although lacking tags and labeling, when a picture is taken with the dresses side by side the only big difference that can be seen is the size and shape of polka dots (Appendix B, Figure 1-2).

If placed in an online marketplace with the correct labels, this garment has a good chance of passing for genuine. The counterfeit dress would not likely sell well in the streets as the fabric is not an overly high quality and was not created by a professional.

The limitation noted on this project is the fabric used and the strategy for creating the smocked back of the garment. The size and shape of the polka dots indicate that the garment is a counterfeit. If replicating this project or research similar to it, a solid garment would work best as the fabric would be easier to match. In addition, if the elastic thread were used to create the smocking instead of the elastic strips, it would have given the counterfeit garment a more accurate appearance, making it harder to detect simply by looking at the garments side by side.

For the purpose of this study, the multispectral imaging would not be overly useful due to the fact that the garment can be detected as a counterfeit to the naked eye. Multispectral imaging should be reserved for use with professionally counterfeited garments as these are often hard to detect since the materials/fabrics and markings are very similar, if not exact as the original product.

Unfortunately the camera imaging requires a lot of space and computer data due to the number of images used per swatch of fabric. To pull garments off of the street would take an enormous amount of data considering the fact that both the original and counterfeit would have to be scanned for over 1,000 images each to be able to detect the difference. Another short-term downfall of multispectral imaging is the development of the programs used to create cubes. The creation of the software is rather time consuming and expensive.

Even though the camera itself is expensive and the new software time consuming, it could be worth the investment when considering the speed and accuracy it offers to agencies. This is one of the few accurate detection methods that does not create any damage to a garment or product. This new and upcoming technology can assist in the decline of the counterfeits throughout the fashion industry, which in turn can help the U.S. economy in many ways.

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Appendix A

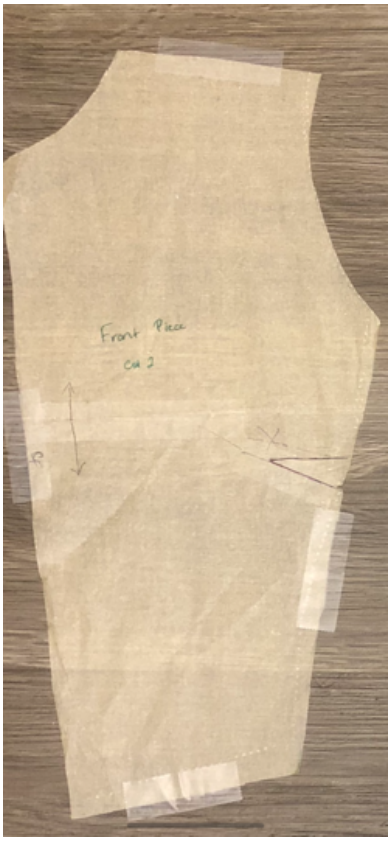

Figure 1. Bodice Front

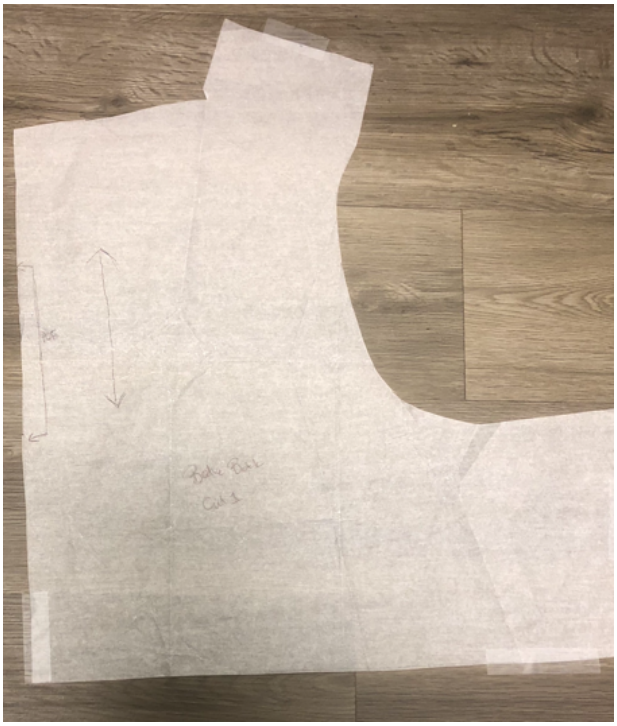

Figure 2. Bodice Back

Figure 3. Skirt Back

Figure 4. Skirt Side Panel

Figure 5. Skirt Front

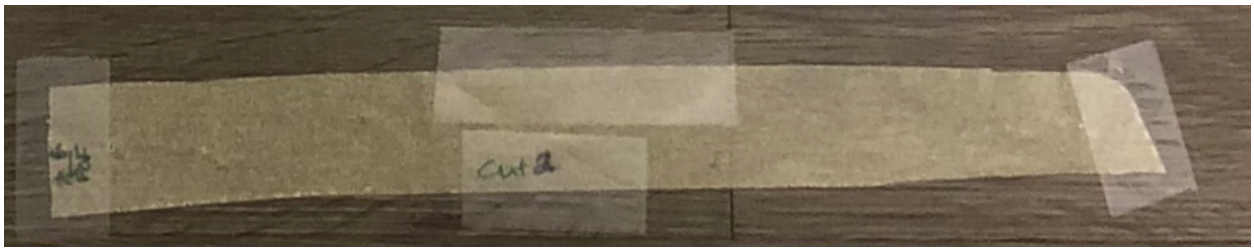

Figure 6. Collar Stand

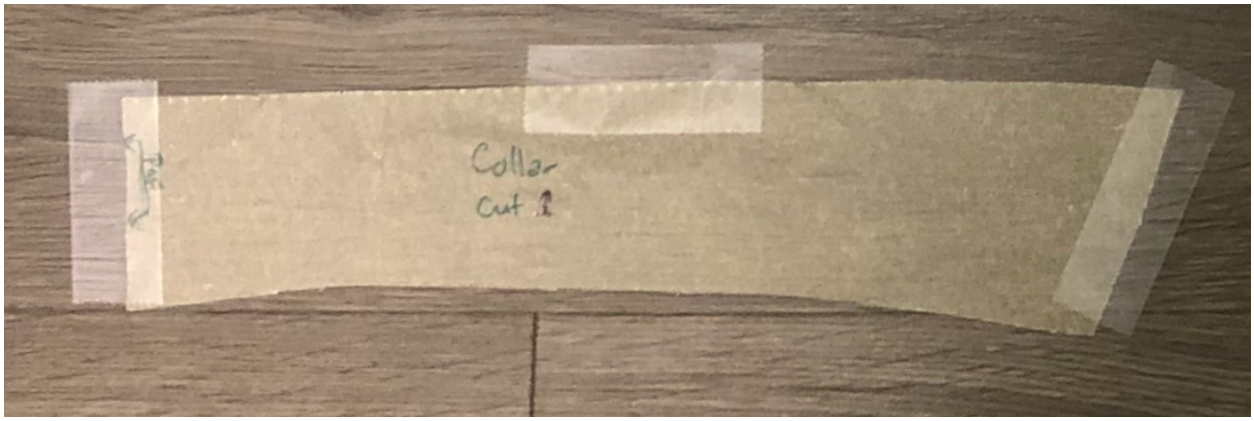

Figure 7. Collar

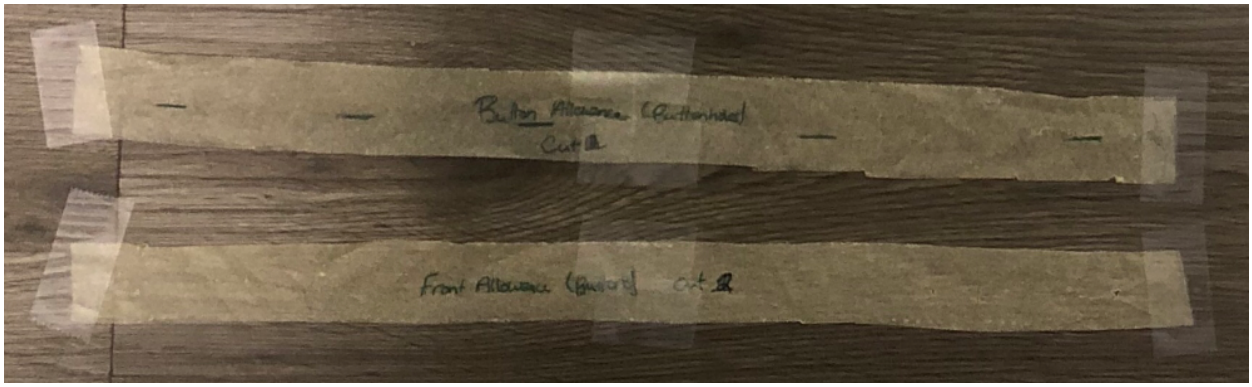

Figure 8-9. Button Bands: Buttonholes (top), Buttons (bottom)

Appendix B

Figure 1. Front of final counterfeit (left) and original garment (right).

Figure 2. Back of final counterfeit (left) and original garment (right).