

Video Forensics

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Abstract. Ever since the invention of the camera, people started speculating the birth of a video-camera that would take live moving-footage of anything. Videos were to be stored on tapes and reviewed as much as the taker or who owns the footage pleases. Audience depended on the owner of the video. As technology advanced, taking videos became easier and thus its sharing too. Videos can be taken from phones and uploaded right away to social media sites. Tampering with videos and changing their ownership became not only possible but simple. Different methods have been used to determine whether the videos are as they were when taken or not. Some of these methods will be investigated in this report.

1 Metadata

Simply put, metadata is data of another data; describing another data. Metadata sums up the important points of the data thus making it easier to work with it. Images, for instance, can have metadata as the color depth, resolution, or date of creation. Upon looking something up in search engines, the results that appear are the product of looking for similarities between input and metatags on web-pages. A person can write the metadata manually or it can be by automated information processing. Manually-added metadata are mostly more precise and can only be done by human. Automated metadata tend to be more to what machines can do internally such as calculate file-size, or date-of-creation.

Just like all files contain metadata, video files do too. Digital forensic examiners perceive the importance of recognizing metadata. Recognizing video metadata is important since it allows the person to distinguish between the real author of the video. There are two types of video metadata: operational and human authored.

Operational metadata is also known as automatically gathered video metadata. This is more or less information about the structure of the video; including the software used, equipment employed, and date and location of creation.

Human-authored is what humans add to the video to increase the ease of finding the video using search engines and to enhance advertising opportunities for online video publishers.

From the marketing perspective, video creators find metadata as extremely important because it thus allows room for smoother accessibility and clearer

understanding for the viewer. Adding metadata to the video makes it more social and thus makes its pursuit less complicated.

Just as everything must have rules of application; for videos' that are to be shared metadata, certain rules or standards have been put. These standards make it more feasible to construct means of searching for this data.

1.1 Video Metadata

The term used to refer to video metadata is Resource Interchange File Format (RIFF). Files such as .wav and .avi still use the RIFF system. Newer files like .wma files use Advanced System Format.

This picture shows what metadata can be gotten from a video. To be capable of viewing this information, certain programs are used. Of which is GSpot, MediaInfo, and Video Inspector.

Gspot Gspot is a program that provides a single-screen preview of all the data in the file. It shows both operational and human-authored data. Its disadvantage is that it has no updated versions since 2007.

MediaInfo MediaInfo is a more updated thus easier to use program that shows metadata of a file. It has several display options to make it easier to determine which metadata is present.

Video Inspector It is more basic than the other two, providing the user with only the essential metadata present in the video. Some sites remove metadata from videos when posting them online. Other sites save files in flash and not their original file format. Thus this makes it harder for investigators to locate the real metadata. or to even make sure that this video is the authentic one.

2 Viral Videos

Videos that have been shared on many social media websites or have been widespread at the time of their taking are said to be viral videos. There is a high possibility such videos have been tampered with; for example changing voices, faces, or even their metadata. This report shows some pictures from videos that have been tampered with and others that have not to show the difference between them.

2.1 Rodney King's Beating 1991

Before "Youtube" was even on the internet, a video managed to make it to the viral stage. During the time "share" buttons were not mainstream, a video managed to reach all houses through just television channels. The "First Ever Viral

Video” was shot by George Holliday, the man who pioneered citizen journalism. Networks shocked Americans by showing them the video in which LAPD officers hit Rodney King more than 50 times with their wooden batons and shock him with the electric stun gun, a sound so horrifying it woke him up in his apartment and a scene so brutal he could not let go without videotaping. Since Holliday could not get any details from the LA police, he resorted to the local television station KTLA. As soon as the video reached local TV stations, it was aired even before a price was stated. After that, all other channels started showing the same video leading to the outraging of the citizens which resulted in a riot.

The jurors who delivered a verdict of ”not guilty” in the case against the police officers who beat Rodney G. King were quoted afterwards as saying that the slow-motion replays of the taped beating in the courtroom ”made all the difference.” Showing the video in super slow-motion, the defense attorneys asked their clients with every movement of King’s elbows if he was complying to their orders or not. The use of slow-motion is some sort of tampering since the frame of time is not the same as reality. This change caused the change of the juror’s opinion and thus the riot of the citizens.

Upon searching for tampered videos on Yahoo search engine, I stumbled upon the URL : <http://www.ncra.org/files/MCMs/742E0AED-4628-4BDD-B91F-296B1B466123.pdf> The pdf file explains briefly this video and how it was used as evidence. It is stated that an investigation happened to ensure that the video was not tampered with and that even though the video was original, it should have not been used as evidence since the jurors did not see King in person. <http://www.rodneykingvideo.com.ar/> is another website that explains in details everything that happened with a brief introduction about George Holliday alongside the video of the beating up and a reportage about Holliday and the incident.

Discrimination has always been the talk of the century. With all heroes starting from Rosa Parks to President Obama trying to demolish inequality, we have reached a somehow healthy environment where communities no longer define a human by his/her skin color. The timing of the video is not long back, being it in 1991. Equality was established then but even though, King was beaten ruthlessly. The need to relinquish the mentality of differentiating between people because of their skin color is what led this video to become viral.

2.2 Sharkeisha’s Video

Bullying has always been an antisocial behavior despised by any sane human. Bullying mostly happens at school or between children as once a person reaches adulthood it is changed to discrimination and is then a crime punished by law. Videos of kids getting bullied are circulating the internet ever since it has been created; including cyber-bullying that blames the internet for being the reason bullying is ever there. A video, though, spread uncontrollably. The video was of Sharkeisha Tyeshia Thompson, a girl from North Carolina, beating up her friend ShaMichael Manuel while a friend filmed it using a smart-phone. The video was first put on Instagram and then it circulated other social media quickly, especially Twitter. The video starts with Sharkeisha talking to Shay in an angry manner.

Shay does not really get the chance to answer but soon Sharkeisha punches her in the face. It is then followed by a kick to which Sharkeisha's friends respond to by pulling her away. The video ends with Shay on the ground covering her head.

Despite the fact that the video viral on the world wide web right after it was posted, it was deleted from the Instagram account right away. It was not removed until it went viral, first posted on worldstarhiphop.com . The video was shared on almost all social media;even memes had been made to make fun of the incident. The video is still on worldstarhiphop but it is mostly known because of the shares it got especially on Twitter.Until today, the video is still getting comments. The video went viral because it is by human nature that violence is hated. The victim also was recognized by her friends and citizens of the state and was thus made fun of wherever she went. No charges were pressed since the victim openly said "I forgive Sharkeisha."

2.3 Sadat's Assassination

President Anwar Al-Sadat was the Egyptian president since 1970 till 1981. Nobel-prize winner for peace changed Egypt's trajectory, leaving the economical and political tenets of Nasserism (Nasser is the previous president of Egypt). He was assassinated in the 6th of October annual victory parade. He has been a controversial figure since the first day he undertook the duty of presidency. His death was actually expected after his trial to impose peace between the Arab World and Israel. He was fighting to get Palestine back to its people and to keep Sina'i as part of Egypt and thus had to win Israel in the 1973 war. The video shows Sadat leaving his palace with his eight bodyguards in a black Cadillac. He arrives to the viewing stadium afterwards . He is seated at the first row between Mubarak and with a five-foot concrete wall in front of him. Lieutenant Islambouly get off a truck and makes his way through to President Sadat who though the lieutenant will salute him and thus stood up. Islambouli instead pulls out a grenade and throws it at Sadat; it does not explode. He threw three grenades in total of which only the last one exploded. Three soldiers jump from the truck behind Islambouli and start moving towards the crowd where Sadat was sitting and shoot non-stop with their fully-loaded. First off is Islambouli who fails to shoot Sadat but then right at his heels was Hassan Abbas, a sniper, and Abd-Elsalam from the right-side. The president's bodyguards escape the scene as soon as the shooting starts. Sadat falls to the ground wounded and tries to remove the chair on him but can not. Many have expected his death during that time, and thus the video of his assassination was an important files. His trials to stand against Israel and America increased his chances in getting assassinated . His trials of accomplishing peace between the Arab World and Israel The fact that foreign ambassadors also attended the military show made it go even more viral. Sadat was a well-known president who challenged a lot of the world's most powerful nations. His video did not just show on national Egyptian channels but on many foreign channels not only to report the incident but also to analyze what happened. When the internet was put to work, foreign

channels uploaded their reviews of the video alongside Egyptians who tried to explain what actually happened. It was a point of interest to people and thus the video has been viral .

2.4 KONY 2012

Kony 2012 is a movie released on 5 March 2012 to raise awareness about the 'Stop Kony' movement. It was actually an experiment done by 'Invisible Children Inc' to check if an online video can turn an obscure war criminal famous. Joseph Kony is a fugitive war crime suspect wanted by international criminal court. He has been a commander in the Lord's resistance Army (LRA) , originally from Uganda. He has been committing crimes for decades, even escaping an arrest warrant in 2005. He has been charged with war crimes and crimes against humanity, including: leading a campaign of rape, mutilation, murder, kidnapping boys and girls to serve as child soldiers and sex slaves, respectively. The video starts with director and founder of Invisible Children Inc, Jason Russel speaking of his son and his birth. He later explains of the world he does not want his son to see; the world full of unfairness and crime. He then moves to the time of his life he went to Uganda and met a child like his son. This kid was called Jacob. Jacob lived in Uganda in fear of the rebels. His life was intolerable due to the killing, kidnapping that happened to whoever tried to escape and the intolerable conditions they had to live in. That was when Russel made a promise to Jacob that he will change all that. Russel then explains Kony's tactics and how Kony made it to number one on the ICC list. Russel tried to convince people with the upper hand to help but it was made clear that it is not an important enough issue on the radar screen of America's conform policy. Upon that, Russel decided to build a large enough community to help children like Jacob. He started moving from state to state informing whoever he can about what was happening in Uganda. he was capable of convincing much people as to go back to Washington and talk to the same officials but now getting the to accept helping Ugandan children. Russell then shows how he got the people of America to join him and support his movement. The video then ends with Russell stating his wish for a better tomorrow.

The video was done to circulate the world , to bring awareness to what Kony has been doing. Major culture-makers and policymakers were targeted to spread the word about him. This, alongside the fact that the video aims to touch the human side of people to get them to support the movement, has helped the video become viral. It went viral on many websites such as youtube, facebook, twitter, and also is still shown in the invisible children page.[4]

2.5 Bush hit by a shoe

The previous president of the United States of America, George Bush, went on a surprise visit to Iraq on Sunday December 14, 2008. Mr.Bush appeared in a Pres Conference with Prime Minister Nuri Kamal Al-Maliki to highlight the newly adopted security agreement between the united states and Iraq. The video shows

how one Iraqi reporter throws two shoes, one after the other at President Bush who ducks to avoid the shoes. The video then shows how the other reporters gather around that man, Muntadhar Al-Zaidi, and beat him. President Bush then says "So what if a guy throws a shoe at me?" He also comments on this being as a trial to get attention and that he can not say that all of Iraq thinks in a similar way. The video went viral because this was almost the first form of violence or intrusion on the President of the strongest country in the world in the modern times. As soon as it was viewed on televisions, it got uploaded to the worldwide web and thus shared on all social media and satellite tv channel websites.

2.6 Six-year-old Girl falls to death in shopping mall

One of the videos that went viral in Malaysia in 2015, is the video of a young girl who falls to death at a shopping mall from an escalator. We found this video being shared a lot on Facebook. In the video, a girl aged six died after being dragged by an escalator in one of the famous shopping centres here in Malaysia. A CCTV footage captured the moment Nurhayada Sofia (the name of the victim) suddenly disappeared through a gap and plunged five floors. It happened while her mother was actively on the phone speaking to someone. Nurhayada is seen in the footage playing with the escalator handrail with another child. She then appears to be dragged over the side and falls.

The video shows shocked bystanders looking over the edge in shock. Nurhayada died after sustaining serious head injuries. The video went viral because people were shocked and disturbed by the mother of the child who was seen as care-less as she was too much into her phone. The society were commenting on the irresponsibility of her.

2.7 Foreign worker saves baby in Singapore

While scrolling through some viral videos which appeared in the news feed of Facebook, one of the videos which caught the attention of many including most news stations was the video where two foreign Indian workers helps save a baby in Singapore. Two Indian nationals in Singapore have been hailed as heroes and commended for saving a dangling toddler stuck between the rails on a parapet of a second floor apartment block. One of the man climbed up to a second floor unit to support the three-year-old girl whose head was trapped in between the rails of an external clothes drying rack outside the service yard. It was said that the toddler was playing with an iPad when it fell over, which was why she tried to climb out after it. The parents of the child were found to be not at home.

2.8 Topless woman in Petaling Street

On the other hand, while people were busy eating and shopping in the streets of Petaling, there came a woman who refused to pay RM18 for two bowls of Chicken

rice and went topless. She was videotaped in an almost two-minute long clip that went viral on social media network like Facebook, taking off her top after an altercation with a food vendor in the Kuala Lumpur's Chinatown. According to Malaysia Insider [1], said the woman appeared to be high when arrested. A urine test conducted later showed she was positive for Methamphetamine. Police are not discounting the possibility that she could be 'high' when the incident happened. Sources said the woman, earlier believed to be a foreigner, claimed to be a Malaysian from Sabah. In the video, which went viral yesterday, the woman was heard shouting "wait, wait stop! Don't do this to me" while trying to free herself from the vendor who was holding her hand. She then said "I want to open my clothes," and seconds after started to remove her white blazer and tops. After taking off her bra, exposing her breasts and tattoo across her back, she challenged the vendor to a fight before walking off.

Reports said the woman had two bottles of beer and a meal believed to be a plate of chicken rice at the restaurant and had allegedly refused to pay for it resulting in the altercation.

2.9 K-pop band hugs Muslim girls on stage

One of the famous viral videos which caught the attention of most Muslims in Malaysia, is the video where a KPop band hugs a bunch of Muslim girls on stage. Media outlet Sukan Star TV's Facebook page uploaded a 3 minute odd video titled, Perempuan melayu dicabul atas pentas oleh mat kpop semalam, suggesting that Malay girls were molested on stage by the idols. With a title like that, it quickly gained traction and it has gone viral. In 9 hours, the video was viewed more than a million times. As seen in the video, some of the B1A4 members were seen hugging and kissing a few tudung-clad Malay girls on stage. There's even a shot of one B1A4 member hugging a girl from behind but here's the thing though, she hugged him again after that voluntarily. How did the fans end up on stage with the idols, you ask? According to one of our team members who was present at the fan meeting, the event people organised a game which required fans to leave questions on a memo board. After which, the B1A4 members themselves picked a question at random each and the fans who wrote the questions will get to go up on stage. Which meant that at that point, even the organisers had no idea which fan, tudung-clad or not, will get to go on stage. Having said that, despite the obvious willingness of the tudung-clad B1A4 fans (as documented), both the group and the K-Pop genre has come under fire since the controversial video emerged. Netizens are far from pleased. In fact, they're raging mad, throwing in comments reflecting anger and shame.

2.10 Susan Boyle, I Dreamed a Dream

Besides just videos of incidents, even videos of performances got viral. Among the notable ones is the performance of Susan Boyle. One of the biggest viral phenomenon of 2009, her powerful voice wowed audiences in the auditions of Britain's Got Talent and the video started to spread. I found her video on Youtube.[2]

3 Integrity

At its most basic level, audio-video-image tampering is the addition, removal or relocation of content in a previously authentic recording. This may occur through editing, quality degradation, or modifications of the file's metadata or properties. For example, a file's GPS metadata can be altered to denote a misleading address for the recorded event. With video, a gun can be inserted into the client's hands, or exonerating details removed. In most cases, these types of changes require minimal skill and access to common editing software. Today, affordable software allows the unskilled computer user to create a new reality in minutes. For example, Adobe Photoshop can remove a gun from a person's hand and automatically correct for background, lighting and shadows to leave a natural looking scene. I will be using MediaInfo to show the videos metadata and to prove they have not been tampered with. A videos URL is copied in the website <http://en.savefrom.net/> to get the file downloaded to the computer. The file is then opened on MediaInfo by clicking on File -> Open -> then choosing the file we want to test. The way the metadata is shown can be altered to suit our preference and thus I have changed it to be Tree by clicking on View->Tree .

4 Origin

The Origin of the video is to determine who the first to take it was or who was the first to post it online or broadcast it on television. For a video to get viral there has to be a certain someone that initiated it and then other users of social media or other television channels shared the video multiple times.

a. For the video of Rodney Kings beating: the origin of the video is stated in the website of Rodney King. It is stated in the video and in the website that the only person to videotape the incident is Gorge Holliday from his apartment and thus he is the origin of the creation of this video. The Supreme Court used the video as evidence and thus checked also for its originality, thus the video is original and has not been tampered with since George Holliday took it. (<https://www.youtube.com/watch?v=xZDrZDEqeKk>) The court of Appeals proves that the person that took the video is George Holliday and thus non other did and his video is the authentic one.

b. For the video of Sharkeisha: The video was first posted by an Instagram account and then was removed right away thus the original video cannot be found ever. Many others shared the video and thus there are many versions on the internet but not the original one. Many websites prove that the original video cannot be retrieved, of which is (<http://www.cbc.ca/newsblogs/yourcommunity/2013/11/sharkeisha-sucker-punching-teen-turns-viral-sensation.html>)

c. For Video of Sadats Assassination: The origin of such a video is not easy to get since it was filmed at 1981 and it cannot be made sure of who was the first to take the video. It was a military show attended by more than one foreign ambassador. Not only national television channels were recording but also foreign ones. The only video that is gotten from a foreign channel that is posted as it was is : (<https://www.youtube.com/watch?v=RY9A3qIFAHs>)

d. For the video of KONY 2012: The video shows that the organization of Invisible children is the one to make the video and thus was the first to share it. The Url is of the account Invisible Children and thus was the first to post the video. It also shows the date in which it was posted which is the same date the short movie was released and thus it can be made sure that this is the origin of the video. (<https://www.youtube.com/watch?v=Y4MnpzG5Sqc>)

e. For the video of Bushs hit with a shoe: The video was taken in a Pres conference which was attended by more than one television channel that was broadcasting live. Thus any video from these channels would be considered as original because all were taken at the same time and all are as authentic as each other. CBS channel recorded the incident and uploaded the incident on Youtube the same day it occurred: (<https://www.youtube.com/watch?v=RFH7C3vkK4>)

f. For the video of Six years old girl falls down from escelator: The video was taken by a person who had the chance to view it from the original CCTV itself. But it is not the CCTV footage. This video was found on Youtube at (<https://www.youtube.com/watch?v=x-5C4Wz8UD4>)

g. For the video of Foreign Worker saves baby in Singapore, from the meta-data extracted it shows that the video is an original video taken by a passerby by his phone. This video was found on Youtube at (<https://www.youtube.com/watch?v=V-GHrsSqcNw>)

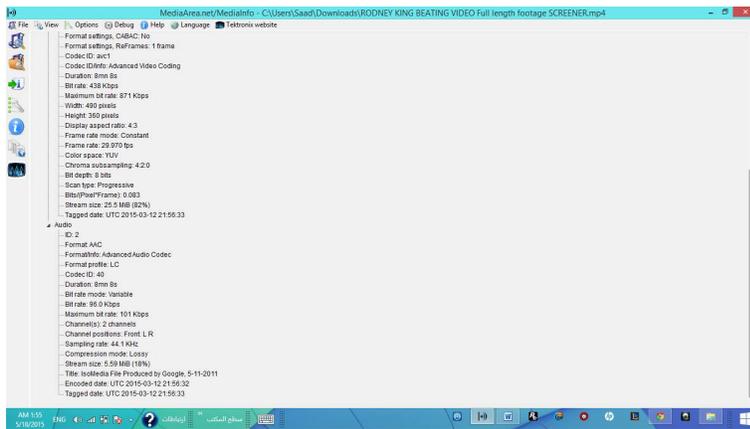
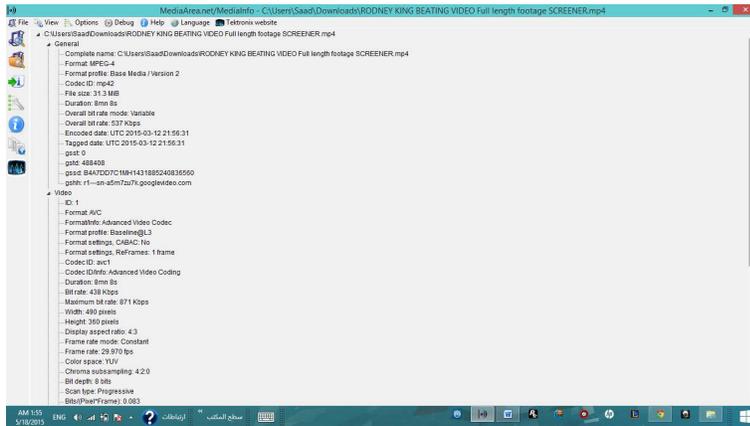
h. For the video of Topless woman in Petaling Street, from the metadata extracted it shows that the video is an original video taken by one of the customers in the food stall. This video was found on Youtube at (<https://youtu.be/xan6IlwvqzA>)

i. For the video of KPop Band hugging Muslim Girls, from the metadata extracted it shows that the video is an not original video but was shot by a phone from an original source. This video is deemed to have happened, because it was featured in local news. This video was found on Youtube at (<https://www.youtube.com/watch?v=A2W5OxlM59I>)

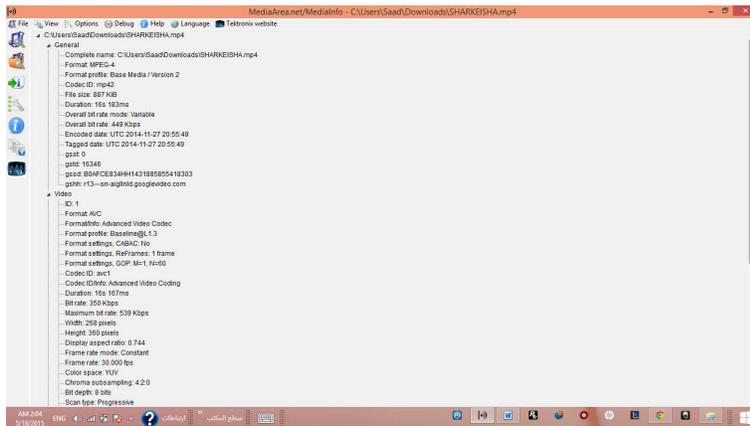
j. For the video of Susan Boyle, from the metadata extracted it shows that the is an original and certified video because it was shot and uploaded by the Britain's Got Talent people. This video was found on Youtube at (<https://www.youtube.com/watch?v=A2W5OxlM59I>)

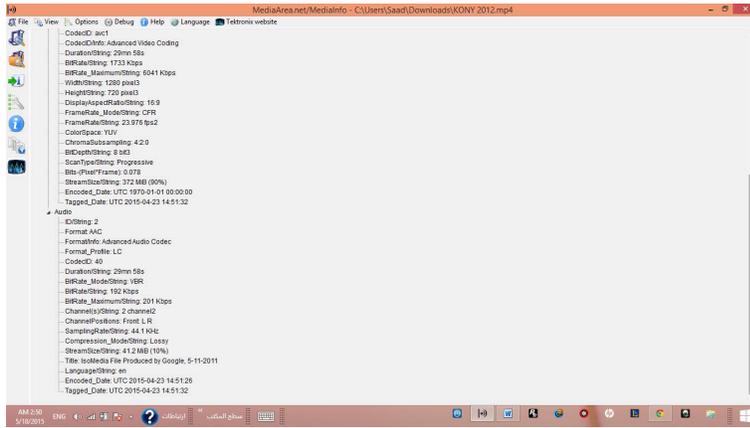
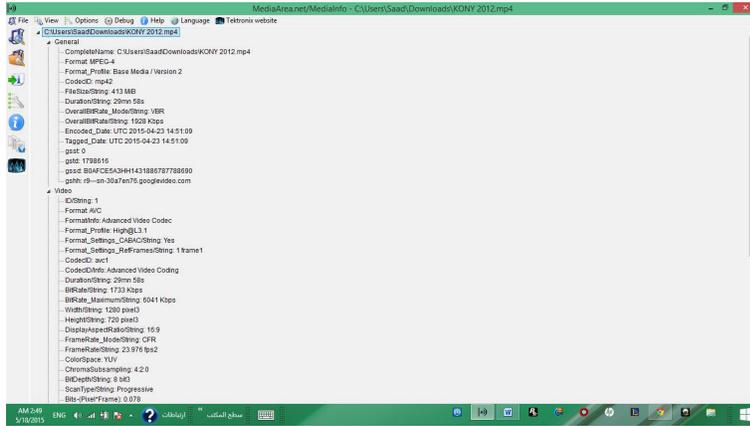
5 Experimental Results

For video 1

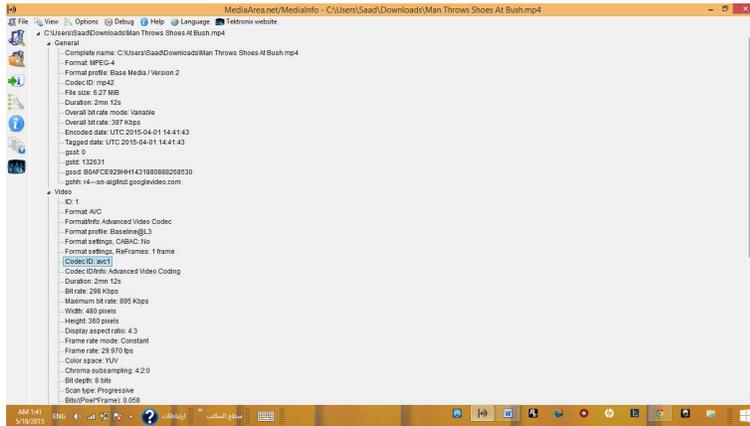


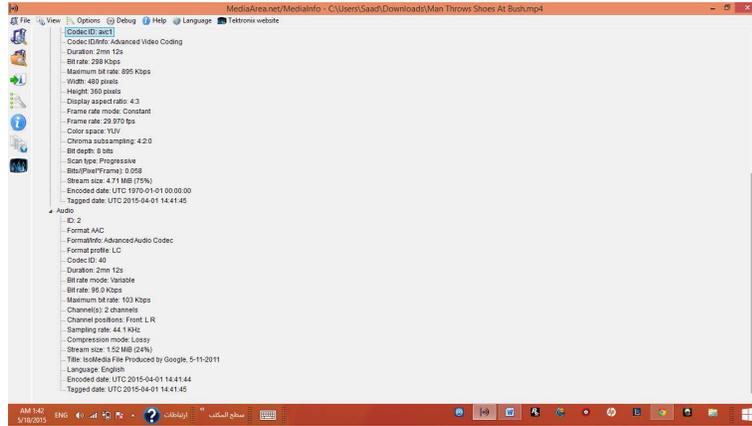
For video 2



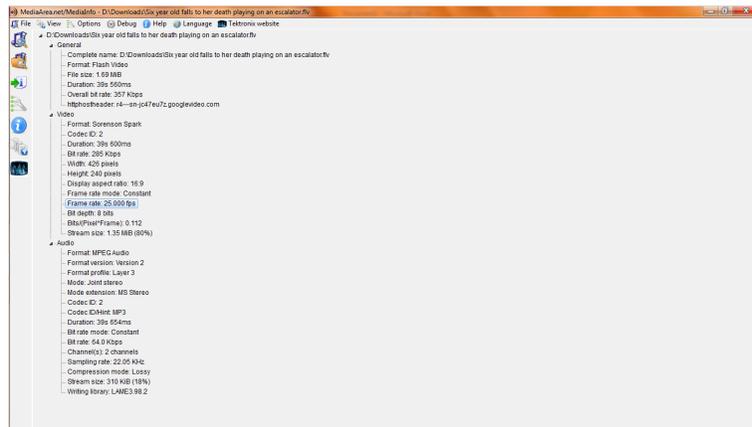


For video 5

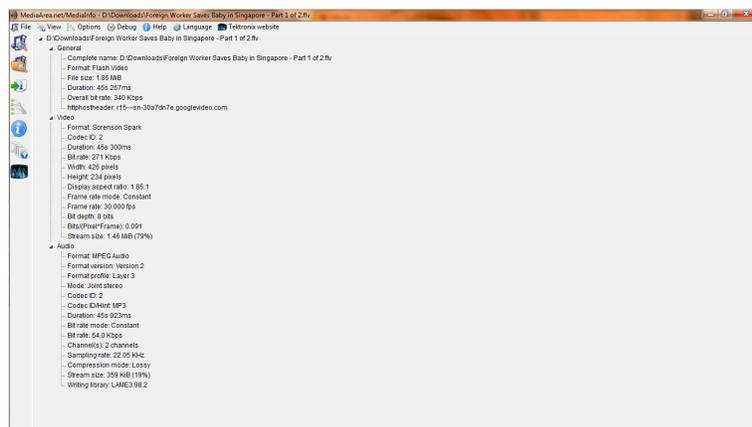




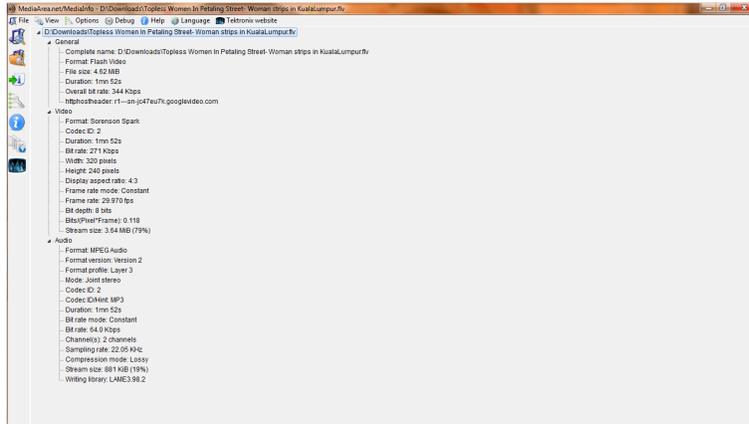
For video 6



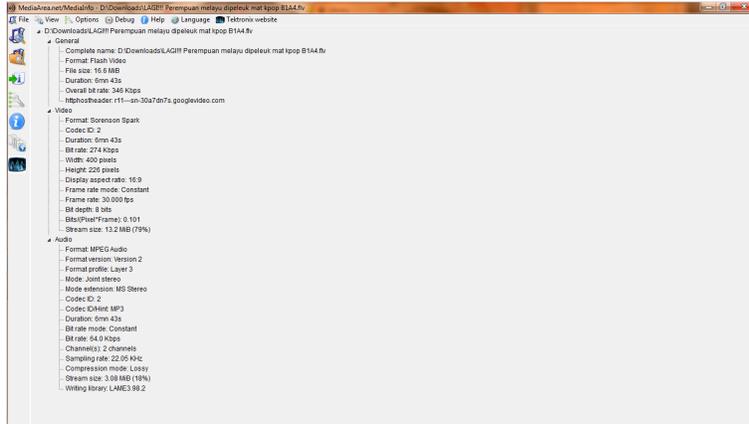
For video 7



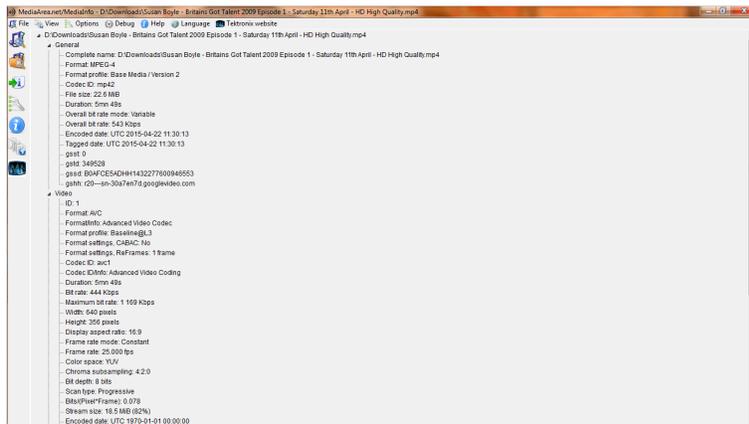
For video 8

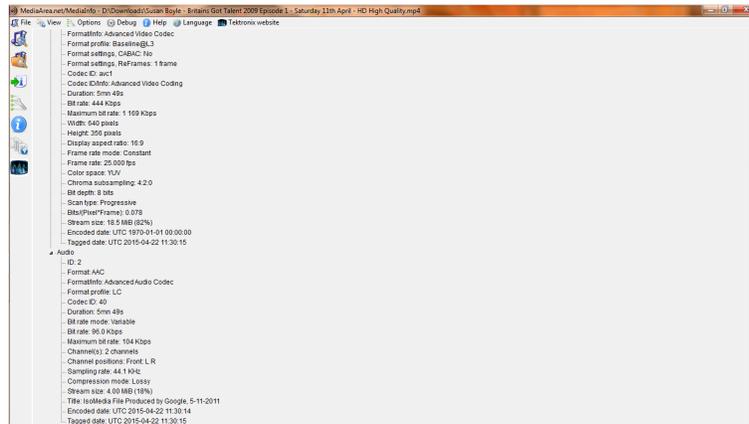


For video 9



For video 10





6 Teamwork

Rana In charge of researching, writing the report and finding out about the metadata, integrity and origin of the first five viral videos, Rodney King’s Beating 1991, Sharkeisha’s Video, Sadat’s Assassination, KONY 2012 and Bush hit by a shoe.

Lydia In charge of researching, writing the report and finding out about the metadata, integrity and origin of the last five viral videos, Six year old girl falls to death in shopping mall, Foreign worker saves baby in Singapore, Topless woman in Petaling Street, KPop band hugs Muslim girls on stage and Susan Boyle’s performance.

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