The forensic architects piecing together the story of war

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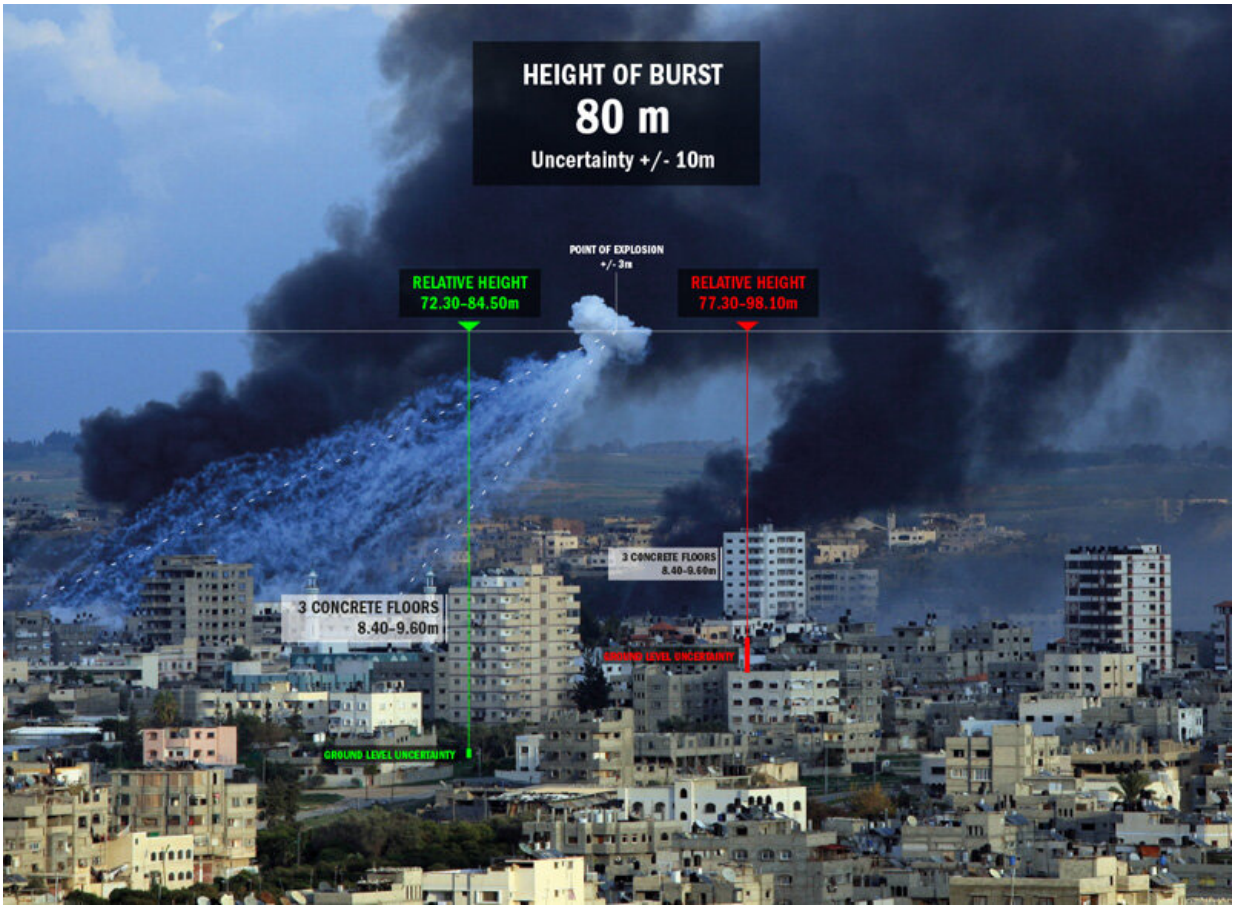

Researchers used forensic architectural techniques to calculate the 'height of burst' of a white phosphorus projectile in Rafah, Gaza, on 11 January 2009. Credit: Iyad El Baba/UNICEF

Around the world there are 10 wars are being fought, according to recent figures. That covers humanity's most deadly clashes, but the figure rises to 49 if you count those state-based conflicts where 'only' 1,000 people or fewer have been killed in the past year. The captain's share of all this fighting happens in cities.

Cities are a kind of beautiful mess, where mazes of streets tangle and millions of lives are played out on top of one another. That can make it difficult to keep track of what's going on when conflict strikes. But it's crucial to do so, not just because reliable records of war crimes can help bring the perpetrators to justice later, but because the story of what happens to a city and its inhabitants during wartime shouldn't be forgotten.

One of the foremost experts at cataloguing what happens in urban warzones is Professor Eyal Weizman at Goldsmiths, University of London, UK. In 2011, he founded the independent research group Forensic Architecture (FA). The organisation's goal is to document human rights abuses around the world and now has a team of roughly 30 people.

Working at the request of human rights organisations or international prosecutors, the team begins investigating reports of crimes or abuse by gathering evidence such as videos, social media posts, photographs and eyewitness statements. Then they use precise architectural models, fleshed out with the media they have collected, to build a story of what happened.

Prof. Weizman says he realised early on that he needed a way of spatially organising the information in the videos in order to be able to understand what they were telling him. "In fact, we realised that the only way to do this is using architectural models," he said.

One of the most striking examples of his team's work concerns the dropping of two chlorine bombs on the Syrian city of Douma on 7 April 2018, as the regime of Syria's dictator Bashar al-Assad was pushing to seize control of the city from rebels.

Reports of people suffering from the effects of the gas quickly emerged. But the regime's attacks were successful—government forces rapidly gained control of the city and only allowed Russian journalists access to the bomb site. These journalists reported that the attack had been staged. A telltale yellow canister could be seen in one building in their footage, but the reports said it had been placed there by the rebels themselves, not dropped from the air.

But was that the truth? To find out, Prof. Weizman's team constructed models of the building using architectural information together with multiple videos of the site. The models showed that the damage to the building was consistent with the bomb being dropped near-vertically from, for example, a hovering helicopter. They also showed that some of the wreckage surrounding the bomb must have fallen from above.

Pieced together, all the evidence made it highly probable that the bomb had dropped from the sky—and with the airspace controlled by the regime, that pointed the finger squarely at Assad. In March this year, a report from the Organisation for the Prohibition of Chemical Weapons also stated that there were reasonable grounds to believe toxic chemical weapons were used in Douma.

Legal work

Using computer models to bring all this evidence together might seem a simple idea, says Prof. Weizman. "But it has unlocked whole new possibilities for journalism and for humans rights legal work." Following this work, he has been appointed one of the technology advisors for the

International Criminal Court in The Hague. As an entirely new form of evidence, it was a battle to get forensic architecture admissible in courts, he says, but now it is being used in multiple cases across the world.

Forensic Architecture's reconstruction of a 2018 attack in Douma, Syria, based on a Russian TV report, showed that the canister came in a harness (in blue) made for aerial ammunition. When it was dropped, the canister tore through a wired fence (in brown) before discharging the chlorine gas, confirmed by the discoloration caused by corrosion near the nose. Credit: Forensic Architecture

Now, in a new project called FAMEC, Prof. Weizman is turning his attention to artificial intelligence to speed up the work. "We need to know to collect, triage and analyse all the material. But sometimes there are just too many videos," he said. "So we want to train machine vision

algorithms to do some of this work for us."

Machine learning algorithms usually need a large library of images on which they can be trained. But when it comes to things like chemical weapon bombs, there are not many images out there, says Prof. Weizman. But he says computers can help here too, by taking existing images and creating multiple renderings at different angles, increasing the library of available images that machine learning algorithms can be trained on.

While Prof. Weizman is focused is on human rights abuses, other architects are interested in documenting what happened in war zones in order to help us get a more accurate picture of what living through war is like, countering some of the sensationalised representations in the press. One is Dr. Armina Pilav, an architect and designer at Delft University of Technology in the Netherlands.

Sarajevo

A formative experience for Dr. Pilav was moving to Sarajevo in 2000 to study architecture. The Bosnian war was a recent memory, and the city of Sarajevo itself had been under siege for four years to 1996. During this time, snipers and tanks were stationed in the mountains surrounding the city and its people were under almost constant fear of shells and bullets.

Even just a few years later, Dr. Pilav says that in her architecture course the war was barely a topic of conversation. "We did not really discuss the war, which was kind of striking," she said. "It was all about looking to the future. But I wanted to take account of the direct experience of the people. Because post-war reconstruction is not simply reconstruction of the buildings."

Unlike Forensic Architecture, Dr. Pilav is trying to understand the lives of those people in the city at a broad level, not produce rigorous evidence about specific events. But she has used methods that are similar to those of Prof. Weizman, harvesting old media reports, eyewitness testimonies, photographs and architectural plans, cataloguing them in order to build an understanding of what people's lived experience of the city was like during the siege. Through these she has come to look at urban war spaces in terms of how areas of violence and areas that were relatively violence-free—which she calls 'un-war spaces' – mingled together and created a new way of life.

Unsurprisingly, Dr. Pilav's research showed that the pre-war and un-war spaces were very different. During the siege, people's movements were restricted to a network of tunnels, semi-underground and covered spaces away from snipers' lines of sight. The actions of the armies and citizens not only damaged many buildings, but resulted in new architectural facets. Shipping containers were used as barricades; semi-submerged trenches were dug, enabling people to get from one building to another. She also showed how people made makeshift heating stoves and, because many buildings did not have chimneys, poked their smoke outlets through holes punched in walls or windows.

Dr. Pilav's work takes the form of art exhibitions and an online repository of her research materials called Un-war space. She says that urban war, in all its messy detail, provided her with a unique window onto the way people and built environments interact.

"During war, people are really relating to their space: they are building shelters and they are trying to normalise their lives," said Dr. Pilav. "I think it is one of the more intense relationships between humans and architecture—not just buildings, but streets, and the environment too. When war breaks out, you are suddenly aware of how a building can be dangerous to you."