

# Photogrammetry for Police Use: Experience in Japan

Close-range photogrammetry is employed throughout Japan for recording evidence regarding traffic accidents.

Introduced first in 1933 in Switzerland for disposal of traffic accidents, the close-range photogrammetry technique was adopted in Germany in 1935. Based on European experiences, the Saitama prefectural police headquarters (in Iruma City, outside the limits of metropolitan Tokyo) obtained in 1967 an accident disposal vehicle specially designed for taking photographs with a stereometric camera set on its top. Excellent results were obtained. Con-

maintaining normal to the base. Such camera set-ups are found to be convenient and almost universal in police applications. The camera pointings are facilitated with viewfinders provided with the cameras. The vehicle, manned by two officers, is fully equipped with photographing and photo-processing facilities along with flood-lighting equipment as may be necessary for photographing in darkness.

In doing police work, the success of the

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*ABSTRACT: The use of close-range photogrammetry techniques by the police in Japan is discussed. Based on European experience, special police vehicles equipped with stereometric cameras were designed and used beginning in 1967. The success of the initial experiments prompted the federal government to support developing the system for police use throughout the whole country. The status and scope of the photogrammetric work in the various police departments in Japan are discussed. Statistical data indicate the extraordinary success of these techniques. Some details of the training program and cost samples are provided. Other countries stand to benefit from the Japanese experience.*

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sequently, this vehicle (see figure 1) has been very popular throughout that country.

The stereometric cameras used by the police in Japan are short-base dual cameras which are rigidly fixed at the two ends of a base-tube. The cameras are arranged with parallel axes which are normal to the base-tube. When the clamps holding the base-tube to the supporting tripod are loosened, the base-tube can be rotated and tilted, i.e., the direction of photographing in stereo can be chosen at will, the camera axes still re-

initial experience of the Saitama prefectural unit has led into a total of 284 cameras (in 1977) in the country of which around 10 percent are imported (mostly Zeiss and Wild) and 90 percent are Japanese made (manufactured by Sökkisha, Asahi, and Nikon). The distribution of these cameras in the various prefectures depends on their work load. Sometimes these are transferable (on loan or otherwise) between prefectures. Some examples of such distributions are (as in 1977) Osaka prefecture, 22; Saitama prefecture, 21; Kanagawa prefecture, 16; and Tokyo prefecture, 8. Obviously, some remote prefectures depend on their neighbors at times of photogrammetric needs.

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FIG. 1. Top view of a Japanese Accident Disposal Vehicle (photo courtesy National Police Headquarters, Tokyo, Japan).

Most of these cameras have a 120 cm base (see, for example, Figures 2 and 3) and are generally used in jobs requiring stereoplotting. For providing additional information and in circumstances requiring very close-range data acquisition and documentation, cameras with 20 cm (for examples, see Figures 4 and 5) and 40 cm bases are also used.

The photogrammetric operations in various police departments involve, among others, simple stereoplotting, curve analyses, determination of cause of accidents, and intelligence gathering activities connected with crimes. These relate to road and railroad accidents, crime documentation (both indoors and outdoors), landslides causing accidents, and other normal police activities. These require the use of supportive stereoplotting instruments (for example, see Figure 6). Of the total of 69 (in 1977)

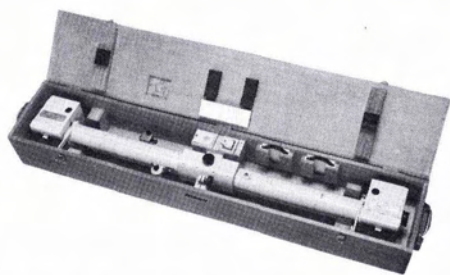


FIG. 2. Nikon TS-120 Stereo Terrestrial Camera in the carrying box (photo courtesy Nikon Nippon Kogaku, Tokyo, Japan).

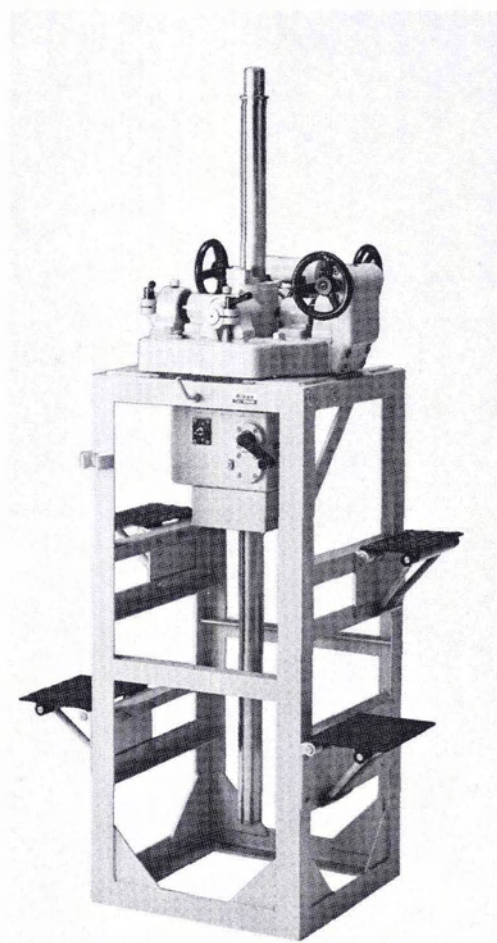


FIG. 3. Mechanism for raising/lowering a stereometric camera in the Accident Disposal Vehicle with police departments in Japan.

stereoplotting instruments used by the police in Japan, around 32 are imported (mostly Wild, closely followed by Zeiss), the remainder being of Japanese manufacture (Sokkisha, Asahi, and Nikon). All of these instruments are capable of yielding three-dimensional data and of continuous map compilation. Currently, several of them are fully digital.

Unless specifically demanded otherwise, all stereo compilation is done at a scale of 1:200 with contouring being optional (see Figure 7).

The extent of police work in the country can be imagined from the 1977 statistics. That year, a total of about 470,000 photo-pairs were taken, of which around 90,000 photo-pairs were actually processed (the rest were taken as a precaution, but later found to



FIG. 4. Nikon TS-20 stereometric camera (20 cm base) for police use on a tripod (photo courtesy Nikon Nippon Kogaku, Tokyo, Japan).

be unnecessary for the settlement of cases). Of these, around 26,000 were actually plotted/mapped. Almost all of these 26,000 stereo models were for the use of various courts. These were invariably submitted with supporting field (ground) measurements of various types as deemed necessary for disposal of cases.

The effectiveness of a stereo camera in police use can be visualized from the following (excerpts from a report of Traffic Guidance Section, Traffic Department, Saitama Prefectural Police Headquarters; 1977):

- Accurate measurement/evaluation/assessment of accident or crime.
- Reduction of workload on the road and



FIG. 5. Close-up view of the Nikon TS-20 stereometric camera (photo courtesy Nikon Nippon Kogaku, Tokyo, Japan).



FIG. 6. Nikon TR-2 stereoplotter for police use (photo courtesy Nikon Nippon Kogaku, Tokyo, Japan).

speedy restoration to normal conditions of a traffic jam.

- Prevention of a traffic accident inflicting an injury.
- Reproduction of the scene of an accident (can observe the spot of an accident in three dimensions).
- A picture taken by a stereo camera is also good as a picture for evidence.
- Ease of preserving the scene of an accident (preservation of the spot of a traffic accident with a negative plate).
- Specialized technicians can process pictures into sketches (maps) collectively.

The above mentioned report lists the following status and scope of using the stereometric procedures:

- The scope of processing stereo pictures into sketch maps: For disposal of numerous traffic accidents inflicting lethal injuries or injuries requiring medical treatment for more than three months. (In cases of accidents inflicting lesser degree of injuries, hand-drawn sketches assisted with stereo photos are generally considered adequate.) Property damage cases receive lower priority.
- The status of the activities of using stereo cameras: In 1976, 60.2 percent of all cases of traffic accidents inflicting bodily injuries were covered with stereo cameras and 23.3 percent of them had their pictures processed into sketches (maps).

The photogrammetric operations of the police in Japan, although initially discouraged by the legal profession, now seem to enjoy considerable support from the judiciary. This and an initial lack of experience resulted in the operations not being very economical during the first three years (1967-70). However, by 1970 when the merits of photogrammetry were realized, the country embarked upon photogrammetric

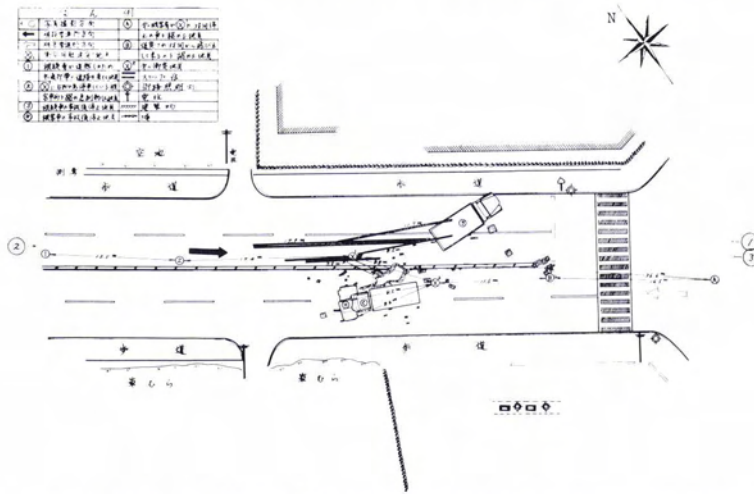


FIG. 7. A stereo compilation depicting the scene of a road accident (courtesy National Police Headquarters, Tokyo, Japan).

systems for the various prefectural police divisions. During the first two years of this program, the country acquired 256 (of the total of 284) cameras. These were primarily obtained by the prefectural units with a 50 percent subsidy from the federal government. All of the 256 motor vehicles were funded by the federal government in view of the national impact visualized at that time.

Japan is divided into 47 administrative divisions (in size and population, somewhat between a state and a county in the United States) known as prefectures. The total police force in the country is around 200,000, of whom approximately 2,600 are involved in photogrammetry-related jobs. Of these, about 200 are photogrammetric plotter-operators, mostly civilians, with roughly 30 percent being uniformed police officers.

After the initial rush of activities in training personnel in photogrammetry during the first eight years of the endeavor, the police authorities now have a continuing training program. A ten-day intensive initial course in photogrammetry and police applications is given to all participants. One person per prefecture is invited to attend this course at federal government expense. This initial course is organized twice each year at the national police headquarters. This initial course is followed by detailed specific photogrammetric training given in the respective prefectural units, usually "on-the-job."

There is now a police textbook for use in such courses of photogrammetric applications.

The photogrammetric operations seem to be very cost-effective. The regular opera-

tions take around 0.1 percent of the total police budget every year in the country. Some cost samples (as of 1978) are ¥2.5 million (about \$10,000.00) for one stereometric camera with accessories; ¥2.0 million for one special vehicle; and ¥2000 for 12 glass plates (all domestically available).

The experience that the police in Japan have had with photogrammetry is exemplary. I took some time to assimilate the remarks of one Superintendent at the National Police Headquarters. He commented that "Generally speaking, for example, there is no road-accident-related court case pending anywhere in Japan beyond one week after the accident." I wish it could be said with equal emphasis in the United States or anywhere else.

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