AlburyCity Comparison of Traffic Data Collection Methods

AlburyCity, New South Wales, Australia

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Turning Movement Counts are the total sum of possible traffic maneuvers at an intersection, and are usually studied during peak hours and broken into 15 minute bins. They are typically done to assess how intersections and roadways operate during different traffic conditions and are used to determine the Level of Service. Measuring the Level of Service provides engineers with information about traffic flow and delay, and helps to determine what improvements can be made to the intersection or roadway.

In order to undertake a broad assessment of AlburyCity's arterial road network, a range of methods were considered for collection of data at intersections, and at midblocks.

A comparison study was undertaken which utilized a range of different counting methods at a single site. The site chosen for this comparison is a 3-leg intersection in a Central Business District with a large shopping precinct, carrying high vehicle and pedestrian volumes.

The comparison involved the use of several different collection methods (see Table 1 for details):

- Miovision TMC system (intersection and midblock);
- Pneumatic tube counters (Metrocount);
- Detector loop data from traffic signals; and
- Manual counts.

Table 1: Comparison of Several Different Collection Methods

Method	Description of Method	Installation at Intersection
Miovision for TMCs and Midblocks	The system consists of a Video Collection Unit (VCU) that collects the video from the field, and online software that analyses the video and produces the data and reports.	Two pole-mounted VCUs were deployed. One collected vehicle and pedestrian movement data at the signalized intersection. The other was positioned to collect midblock vehicle data, approximately 65ft from the signalized intersection.
Metrocount 5600 Series	Midblock vehicle axle count data is collected through a roadside unit connected to pneumatic tubes. The data is then able to be analyzed using Metrocount's Traffic Executive software.	Pneumatic tube counters collected vehicle data approximately 65ft from the signalized intersection. Two separate counters were deployed to allow each direction of traffic to be monitored independently.
Inductive Loops	A coil of wire (a loop) is placed under the road surface and connected to a traffic signal controller. Information on the number of vehicle movements over the inductive loop can be collected for each loop.	Detector loop data was collected at the signalized intersection using data collected from the New South Wales Roads and Traffic Authority's (NSW RTA's) Sydney Co-ordinated Adaptive Traffic System (SCATS).
Manual Counts	The process involves deploying staff to log individual vehicle movements at a particular location. If the volume of traffic is high, a number of individuals may be required. The data collected must then be collated and processed for presentation as turning movement data.	Manual counts were not undertaken in the field, but were instead completed in the office using the video footage from the midblock and intersection camera units.

By utilizing the different collection methods, it was possible to complete the following cross-checks:

Intersection Cross Check

VCU (Intersection) VS. SCATS VS. Manual count

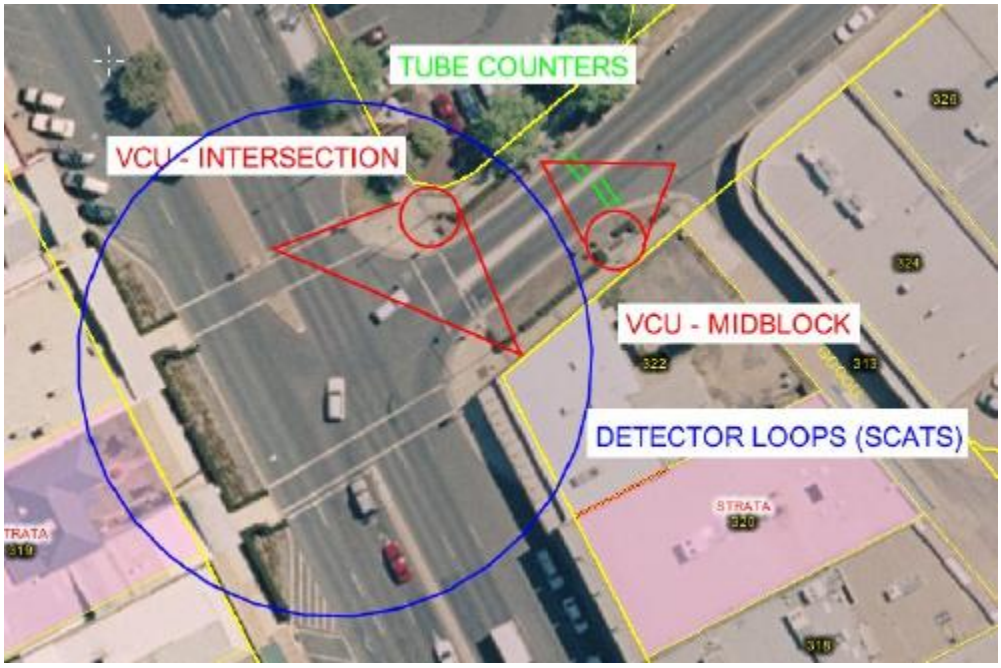
Midblock Cross Check

Pneumatic tube counters VS. VCU (Midblock) VS. VCU (Intersection using selected movements) VS. SCATS VS. Manual count

Data was collected on Friday 22 January 2010, over the period 11AM to 12PM.

Being a central business district and retail area, this was the busiest time of day for the intersection.

Figure 1: Bird's Eye View of Intersection Being Studied



Results

Table 2: Midblock Results from 11 AM to 12 PM

Direction	Tubes	VCU (Midblock)	VCU (Intersection)[1]	SCATS[1]	Manual[2]
Southbound	284	337	340	336	345
Northbound	341	345	349	298	344
Two-way	625	682	689	634	689

1. The VCU (Intersection) and SCATS data is determined from the intersection count data: southbound movements are determined by combining the southbound left and right turn data, while northbound movements are determined by combining the westbound right turn data with the eastbound left turn data;
2. The manual data was not collected directly in the field: it was collected by reviewing the midblock video footage at original speed (to replicate as closely as possible field counting conditions), and was undertaken for a period of one hour only.

In general, the results from the different methods are within 3% of each other. The main exception is the southbound tube counters under-counting by more than 10%. This is due to the proximity of the tube counters to the hold line for the signalized intersection. Vehicles queuing and crossing with their front axle and not the back, stopping on tubes, or crossing tubes at less than 10km/h all cause tube counters to incorrectly register vehicle movement, or not at all.

The next most significant variation was with the SCATS northbound data. As this data was a combination of the data obtained from the westbound right turn and the eastbound left turn, and the westbound right turn was typically under-counted by SCATS by approximately 20%, this is to be expected.

Minor variations were expected, due to slight time differentials between the different data collection units – the tube counters and VCUs were not completely synchronized, and so were up to 2 minutes out (for example, 11.09 AM on the southbound tube counter corresponded to 11.11 AM on the midblock VCU).

Table 3: Intersection Results from 11 AM to 12 PM

Intersection	VCU (Intersection)				SCATS				Manual[1]			
	R	L	U	Tot	R	L	U	Tot	R	L	U	Tot
Griffith Road (southbound)	81	259	0	340	-	-	-	336	83	258	-	341
Urana Road (westbound)	287	367	3	657	231	274	-	505	289	366	3	658
Urana Road (eastbound)	322	62	0	384	345	67	-	412	354	63	-	417
Total	1381				1353				1416			

1. The manual data was not collected directly in the field: it was collected by reviewing the video footage at the intersection for a period of one hour only. Pedestrians and cyclists were not counted, and vehicles were not classified into cars/trucks;
2. Movement Codes: R = Right, T = Through, L = Left, U = U-Turn.

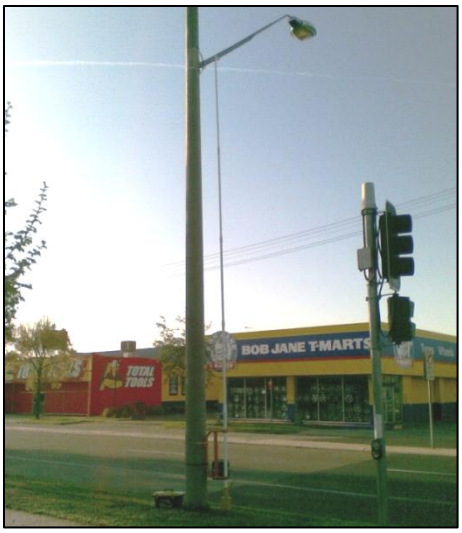
For the southbound approach (Griffith Road), and also for the intersection overall for the period 11.00-12.00, the results were generally within 3% of each other, showing a good correlation. As with the midblock count data, minor differences were expected due to the slight time differentials between the different units.

A significant difference was noted on the westbound approach. The SCATS data under-counted by approximately 20% on this approach compared to the VCU data. The undercounting is more significant on the right turn than the through traffic. The one hour of manual count data tends to support the VCU data rather than the SCATS data. Issues for this variation could include faulty detector loops, vehicles travelling through the intersection without triggering the loop (especially on the left-most through lane), or small gaps between low speed turning vehicles leading to two vehicles registering as one.

There were some differences on the eastbound approach, most notably the 10% differential between through movements determined by the VCU and the manual count. It could be that the VCU undercounts slightly due to through traffic in the near lane obscuring through traffic in the far lane, or alternatively, 2 cars travelling close to or adjacent to each other might be registered as one medium or heavy truck. This would be expected to be more of an issue on this particular leg due to the higher proportion of medium and heavy trucks on this leg. However in general, there is less than 5% between the VCU data and the other results, and the total values for all movements over three hours is less than 1% between the VCU data and the SCATS data.

Table 4: Intrusiveness of the Different Counting Methods

Method	Level of Intrusiveness
SCATS	Requires no attendance on-site
Miovision	Requires on-site set-up, but operations are limited to the road verge, as the unit is attached to a light or power pole
Manual Counts	Requires field staff to be exposed to the elements, although operations are limited to the road verge
Road Tubes	Requires employees to operate in the road carriageway, requiring additional staff to operate as spotters, or alternatively, using traffic control to close part or all of the roadway for installation and removal.



Miovision Pole-Mount VCU

Cost Comparison

The capital and ongoing costs of the data collection vary depending upon the method employed. SCATS data requires no capital cost, but a cost of $525 was quoted for this site.

Manual counts vary depending on the complexity of the intersection, the length of data collection and whether in-house or external resources are utilized, but typically would be of the order of $500-$1,000 for an intersection such as this.

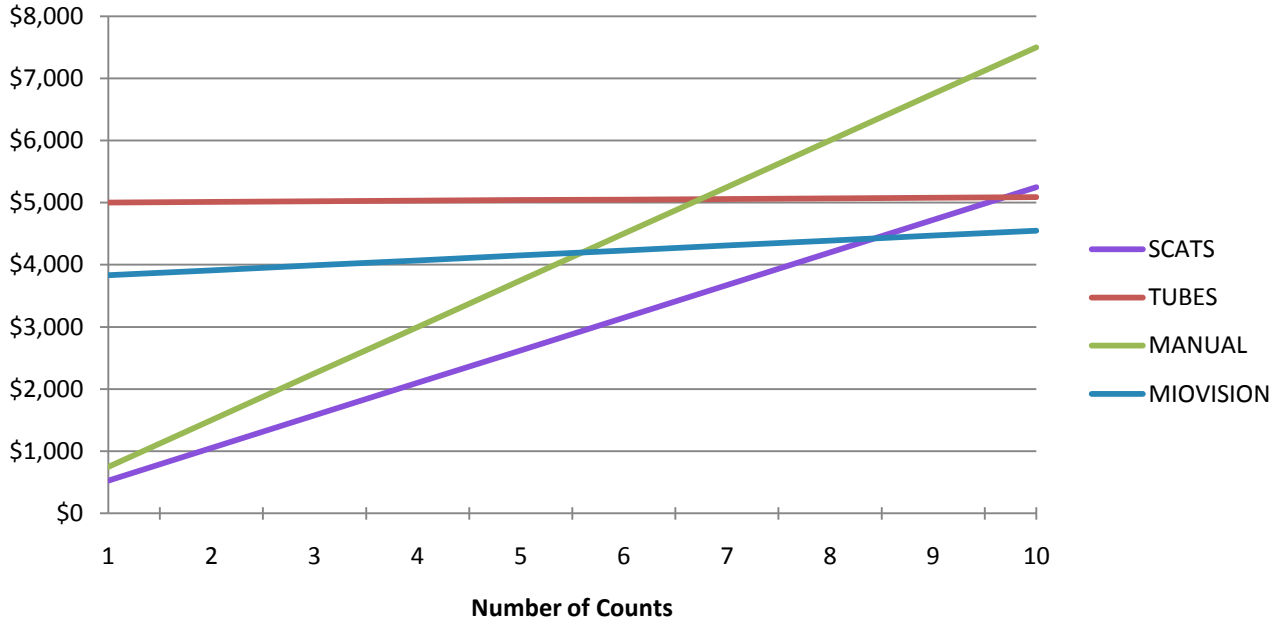
Miovision's pole-mounted units have a capital cost of less than $3,000 per unit, with software costing an additional $750 and processing of data typically between $15-25 per hour.

Tube counters cost in excess of $5,000 per unit to purchase (although units can be traded in, lowering the cost to about $3,500 per unit), with minimal ongoing costs.

While SCATS is the safest and cheapest method for collecting intersection data, it does have some drawbacks, including:

- It can only be utilized at signalized intersections, so cannot be used to collect data on roundabouts, Stop or Give Way intersection;
- It does not provide details of turning movements where more than one turning movement can be completed from a single lane;
- SCATS does not provide vehicle classification data; and
- Faults in the detector loops can result in counting errors.

Figure 2: Costs of the Different Counting Methods



For intersection data collection, the Miovision system is more cost effective than undertaking manual counts on more than 5 intersections. For five intersections, manual counting would cost approximately $3,750 (assuming a total cost of $750 per intersection) where Miovision would cost $4,150 for hardware purchase, set-up and processing. However, for each additional intersection beyond this, the Miovision system costs only an extra $80 (4 hours of analysis per intersection at $20 per hour), compared to an extra $750 for manual counting. The Miovision system is also safer, and with the ability to replay video footage is fully auditable. Some SCATS data may be required to determine current signal phase and cycle times, although this can be collected in the field or determined through review of video footage.

Conclusion and Recommendation

This investigation has concluded the following:

- The Miovision TMC System provides an accurate method of collecting turning movement data at intersections. The system is more accurate and cost-effective than engaging contractors to undertake manual counts for all but the smallest scale investigations. The Miovision TMC System is recommended as AlburyCity's preferred method for collection of vehicle movement data at intersections.
- Although the use of detector loop data for collecting turning movement data at intersections is cheaper than the Miovision TMC System, it does not provide a similar accuracy or level of detail of information. Detector loops are also only present at signalized intersections, meaning alternative methods must be utilized to collect turning movement data at unsignalized intersections. Detector loop data from SCATS remains useful with regard to phase and cycle times at signalized intersections.
- It is noted that the Miovision TMC System is more expensive, but safer than the use of pneumatic tube counters, as there is no need for staff to enter the carriageway.