ARTERIAL TRAFFIC MANAGEMENT TECHNIQUES IN HARRIS COUNTY

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ITE SUMMER MEETING – COLLEGE STATION, TX - JUNE 24TH, 2006

Presentation Outline

- Standardization of Timing Parameters
- Selection of Cycle Lengths [Harmonic]
- Offset Reference Point / Sync Time
- Tricks for Improving the Flexibility of Coordination Timing
  - Actuated Lagging Left-Turns
  - Use of the Simultaneous Gap Feature
  - Hold Flags at Dual-Coordination Intersections
- Special Logic Conditions (Auxiliary Functions)

Standard Timing Parameters

HARRIS COUNTY TIMING PARAMETERS [SEC]

TIMING PARAMETERS	LEFT TURN	MINOR THRU	MAJOR THRU
MINIMUM GREEN	3	5	7
PASSAGE TIME	2.0	2.0	4.0
MINIMUM TERMINATE	8	12	12
MAXIMUM GREEN I	20	25	45
MAXIMUM GREEN II	25	35	65
ADDED INITIAL	N/A	N/A	1.5
TIME TO REDUCE	5	5	5
TIME B4 REDUCTION	5 / 10	10	10
MINIMUM GAP	1.0 / 1.5	1.0 / 1.5	3.0
MAXIMIM INITIAL	N/A	N/A	15 / 20

HARRIS COUNTY MAX TIMIING FOR LEFT TURNS [SEC]

LEFT TURN	LIGHT LEFT	MODERATE LEFT	HEAVY LEFT
MAX I	20	25	25
MAX II	25	35	45

HARRIS COUNTY MAX TIMING FOR THRU MOVEMENTS [SEC]

THRU MOVEMENT	MINOR THRU	MAJOR THRU	MAJOR / MAJOR
MAX I	25	45	35
MAX II	35	65	55

Selection of Cycle Lengths

- Cycle Lengths in Harris County
  - Range from 60 seconds to 135 seconds
  - Selected as Harmonic Multiples of each Other
  - Allows system to be Broken into Subsystems by TOD
- Underlined Cycles Depict Core Cycle Lengths

HARRIS COUNTY CYCLE LENGTHS [SEC]

MINOR ARTERIAL	MAJOR ARTERIAL	COMMON MULTIPLE
60	90	180
70	105	210
80	120	240
90	135	270
x 3	x 2	x 3 or x 2

Determination of Subsystems

- **Same Schedule is used at all Locations**
  - **Subsystem Depends on Traffic Volumes (Residential)**
  - **No need to worry about Offsets as Plans are Harmonic**
  - **All Cycle Lengths run Seamlessly on the 1-1 Ratio**

HARRIS COUNTY CYCLE USES FOR MAJOR AND MINOR SYSTEMS [COMMERCIAL = MAJOR / RESIDENTIAL = MINOR]

CYCLE LENGTH	MAX GREEN	MINOR PLAN #	MAJOR PLAN #	CYCLE USES
60	MAX I	[4]	N/A	MINOR OFF-PEAK
70	MAX I	1	5	MINOR MIDDAY / MAJOR LATE-NIGHT
80	MAX I	2	N/A	MINOR AM-PEAK
90	MAX I	3	4	MINOR PM-PEAK / MAJOR OFF-PEAK
105	MAX I	N/A	1	MAJOR MIDDAY
120	MAX II	N/A	2	MAJOR AM-PEAK
135	MAX II	N/A	3	MAJOR PM-PEAK

Default Harris County Schedule

HARRIS COUNTY DEFUALT SCHEDULE TABLE [ADAPTABLE TO MAJOR AND MINOR SYSTEMS VIA PLAN SELECTION]

HR	MIN	S	M	T	W	T	F	S	MINOR	MAJOR	BOTH	PLAN DESCRIPTION
00	00	X	X	X	X	X	X	X	FREE	FREE	FREE	HC FREE OPERATION
05	45		X	X	X	X	X		FREE	4 [90]	4 [90]	HC OFF-PEAK
06	30		X	X	X	X	X		2 [80]	2 [120]	2 [120]	HC MORNING PEAK
08	00	X						X	1 [70]	4 [90]	5 [70]	HC OFF-PEAK
09	00		X	X	X	X	X		1 [70]	4 [90]	5 [70]	HC OFF-PEAK
10	45							X	3 [90]	3 [135]	4 [90]	HC AFTERNOON PEAK
11	30	X	X	X	X	X	X		1 [70]	1 [105]	5 [70]	HC MIDDAY-PEAK
14	30		X	X	X	X	X		1 [70]	1 [105]	1 [105]	HC MIDDAY-PEAK [STEP]
16	00		X	X	X	X	X		3 [90]	3 [135]	3 [135]	HC AFTERNOON PEAK
19	00	X	X	X	X	X	X	X	1 [70]	1 [105]	5 [70]	HC MIDDAY-PEAK
20	30	X	X	X	X	X	X	X	FREE	4 [90]	FREE	HC OFF-PEAK
22	00	X	X	X	X	X	X	X	FREE	5 [70]	FREE	HC LATE-NIGHT

Split Timing

HARRIS COUNTY MINIMUM SPLIT TIMING / YIELD PERIODS BY CYCLE [SEC]

CYCLE LENGTH	VARIABLE YIELD	LEFT	THRU	PERM
60	5	12	16	22
70	5	14	18	24
80	10	14	18	24
90	10	14	22	28
105	10	14	22	28
120	15	18	24	32
135	15	18	24	32

0.95	CYCLE = 60		
VPC	LT	TH	PER
1	12	16	22
2	12	16	22
3	14	16	22
4	14	16	22
5	14	16	22
6	14	16	22
7	16	16	22
8	16	16	22
9	N/A	16	22
10	N/A	18	22
11	N/A	18	22
12	N/A	18	22
13	N/A	18	22
14	N/A	20	22
15	N/A	N/A	24
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A

0.95	CYCLE = 70		
VPC	LT	TH	PER
1	14	18	24
2	14	18	24
3	14	18	24
4	14	18	24
5	14	18	24
6	16	18	24
7	16	18	24
8	18	18	24
9	18	18	24
10	18	18	24
11	N/A	18	24
12	N/A	20	24
13	N/A	22	24
14	N/A	22	24
15	N/A	N/A	26
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A

0.95	CYCLE = 80		
VPC	LT	TH	PER
1	14	18	24
2	14	18	24
3	14	18	24
4	14	18	24
5	14	18	24
6	16	18	24
7	18	18	24
8	18	18	24
9	18	18	24
10	20	20	24
11	N/A	20	24
12	N/A	22	24
13	N/A	24	28
14	N/A	24	28
15	N/A	24	28
16	N/A	N/A	N/A
17	N/A	N/A	N/A
18	N/A	N/A	N/A

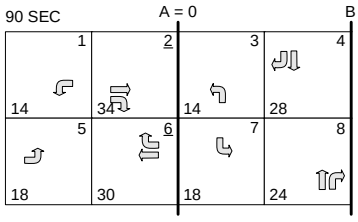
0.95	CYCLE = 90		
VPC	LT	TH	PER
1	14	22	28
2	14	22	28
3	14	22	28
4	14	22	28
5	18	22	28
6	18	22	28
7	18	22	28
8	18	22	28
9	22	22	28
10	22	22	28
11	22	22	28
12	24	24	28
13	N/A	24	28
14	N/A	28	32
15	N/A	28	32
16	N/A	28	32
17	N/A	N/A	N/A
18	N/A	N/A	N/A

0.95	CYCLE = 105		
VPC	LT	TH	PER
1	14	22	28
2	14	22	28
3	14	22	28
4	18	22	28
5	18	22	28
6	18	22	28
7	18	22	28
8	22	22	28
9	22	22	28
10	24	24	28
11	28	24	28
12	28	28	32
13	28	28	32
14	N/A	32	36
15	N/A	32	36
16	N/A	32	36
17	N/A	N/A	N/A
18	N/A	N/A	N/A

0.95	CYCLE = 120		
VPC	LT	TH	PER
1	18	24	32
2	18	24	32
3	18	24	32
4	18	24	32
5	18	24	32
6	18	24	32
7	24	24	32
8	24	24	32
9	24	24	32
10	28	24	32
11	28	28	32
12	32	28	38
13	32	32	38
14	N/A	32	38
15	N/A	38	44
16	N/A	38	44
17	N/A	38	44
18	N/A	N/A	N/A

0.95	CYCLE = 135		
VPC	LT	TH	PER
1	18	24	32
2	18	24	32
3	18	24	32
4	18	24	32
5	18	24	32
6	24	24	32
7	24	24	32
8	24	24	32
9	28	28	32
10	28	28	32
11	32	32	38
12	32	32	38
13	38	38	44
14	38	38	44
15	N/A	38	44
16	N/A	44	48
17	N/A	44	48
18	N/A	N/A	N/A

Why Use Max I/II Timers?



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HARRIS COUNTY MAX TIMING FOR THRU MOVEMENTS [SEC]

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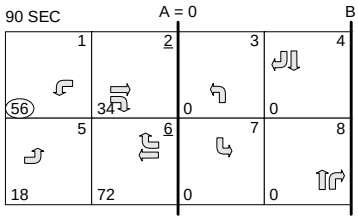
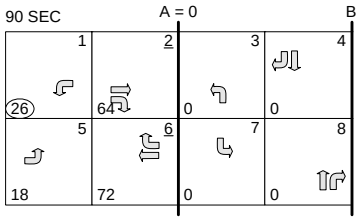
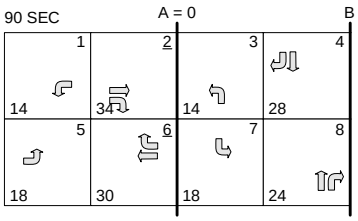


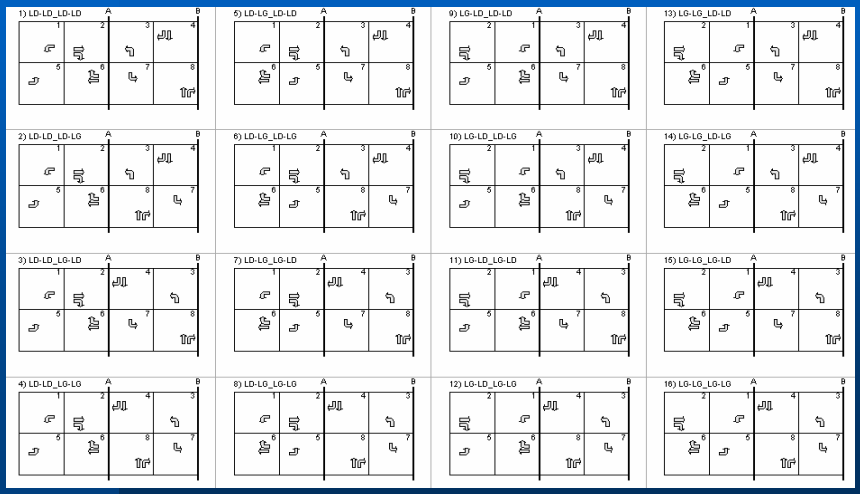


Controller Sync Time

- Comments Regarding the Offset Reference Point
  - Know where it's Referenced From (BOG / EOG)
  - Make sure Sync Time is the Same on all Controllers
  - 24:00 is not the same as 0:00 on some Controllers



Default Phase Sequence Tables

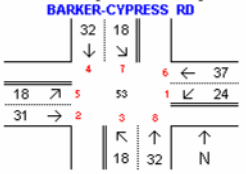


Flexible Coordination Timing

- Actuated Lagging Left-Turn
- Dual-Coordination Example

LOCATION: CLAY RD & BARKER-CYPRESS RD — LAST REVISION: 07/05/2005

PLAN-1 [MIDDAY PEAK]
BARKER-CYPRESS RD

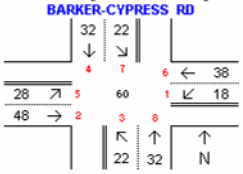


NOTES:

CLAY RD & BARKER-CYPRESS RD — OFFSET: - 53 SEC [50%]

PHASE ->	1	2	3	4	5	6	7	8	TRN	CYC
MINIMUM	20	20	15	20	15	25	15	20	23%	75
NOMINAL	24	26	18	32	18	37	18	32	52%	105
MAXIMUM	30	45	25	40	25	50	25	40	33%	140
CONTROL	ACT	CRD	ACT	HLD	ACT	CRD	ACT	ACT	MAX:	1
SEQUENCE	LEAD	LAG	LAG	LEAD	LAG	LEAD	LEAD	LAG	SEQ:	7

PLAN-2 [MORNING PEAK]
BARKER-CYPRESS RD



NOTES:

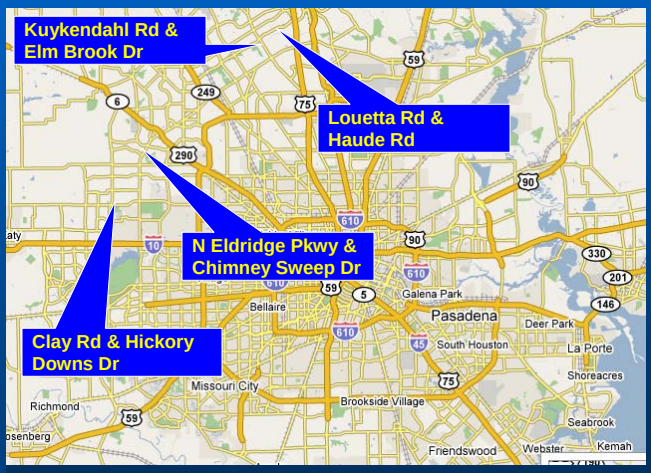
CLAY RD & BARKER-CYPRESS RD — OFFSET: - 60 SEC [50%]

PHASE ->	1	2	3	4	5	6	7	8	TRN	CYC
MINIMUM	15	30	15	20	20	25	15	20	33%	80
NOMINAL	18	48	22	32	28	34	22	32	55%	120
MAXIMUM	25	65	30	40	35	55	30	40	33%	160
CONTROL	ACT	CRD	ACT	ACT	ACT	CRD	ACT	HLD	MAX:	2
SEQUENCE	LAG	LEAD	LEAD	LAG	LEAD	LAG	LAG	LEAD	SEQ:	10

Eric's Bag of Tricks

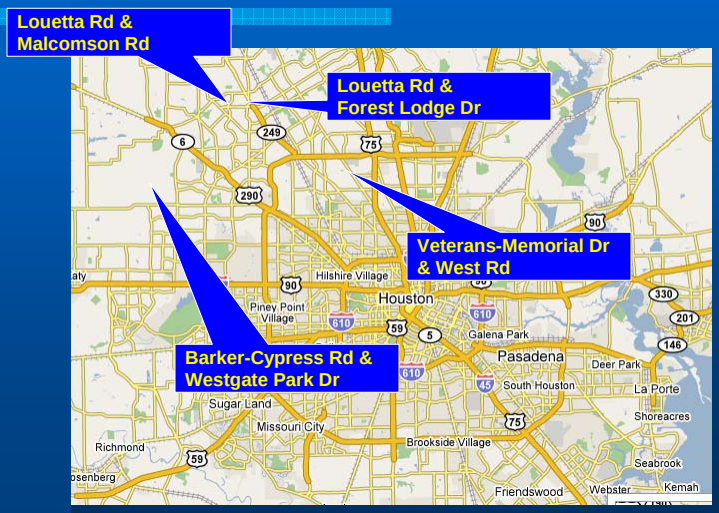
- Typically Implemented by Time-Of-Day
  - Variable Gap Time
  - Double Service of Left-Turns
  - Floating Force-Off by Phase
  - Right-Turn Detector Logic
  - Split-Phase Based on Queue Detection
  - Left-Turn Queue Detection for Single Lane Approaches
  - Variable Walk Time Based on Push Button Input
  - Pedestrian Cross Switching and Head Starts by TOD

Variable Gap Time Examples



Variable Gap Time Examples

Double Service of Left-Turns



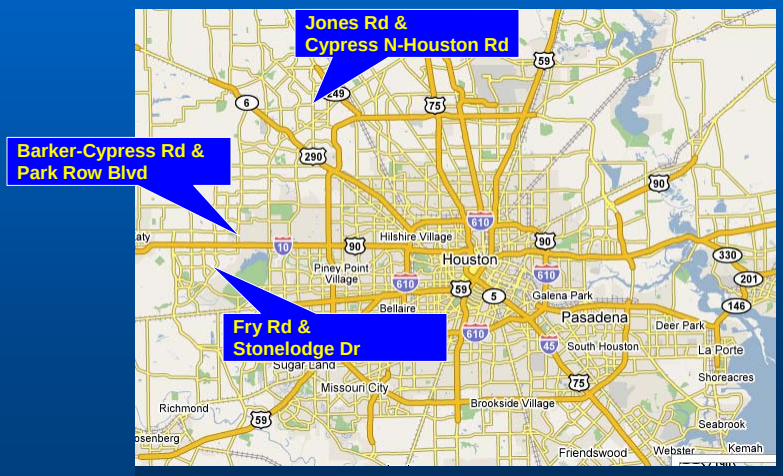
Double Service of Left-Turns

Veterans-Memorial Dr & West Rd

Floating Force-Off Example

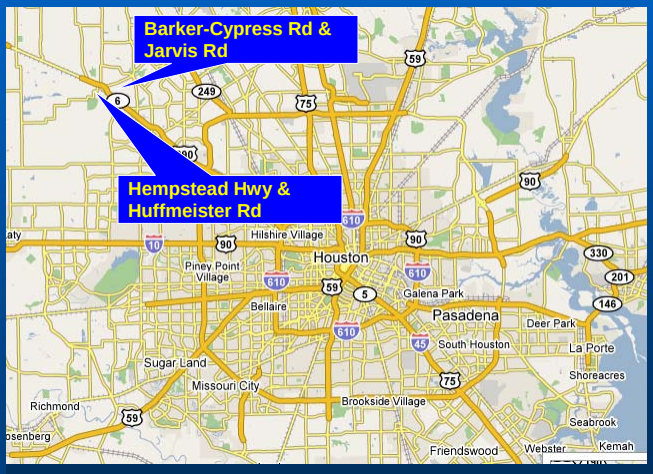
Floating Force-Off Example

Right-Turn Detector Logic



Fry Rd & Stonelodge Dr

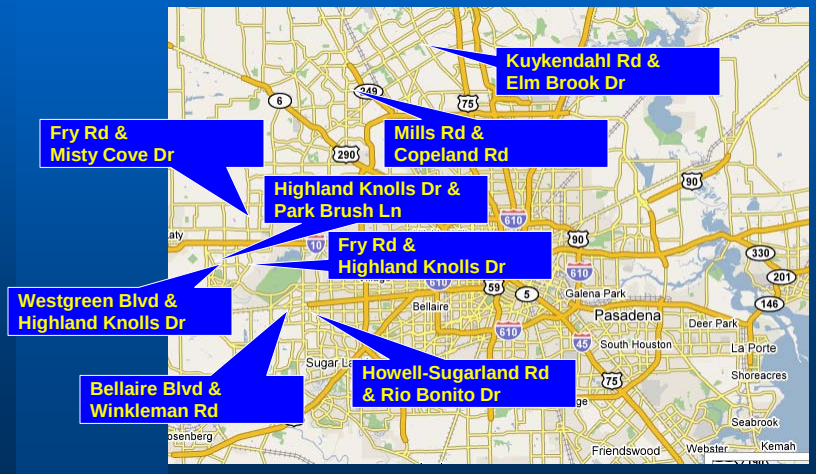
Left-Turn Queue Detection Example



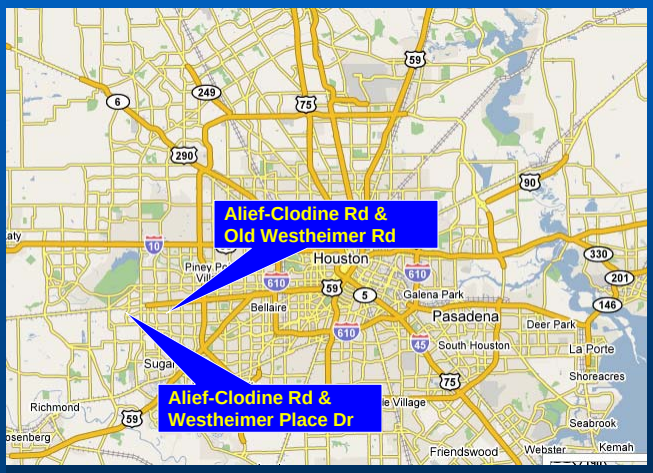
Left-Turn Queue Detection Example

- Huffmeister Rd & Hempstead Hwy

Special Pedestrian Logic Locations



Complex Intersection Examples



WPTR & Old Westheimer Rd

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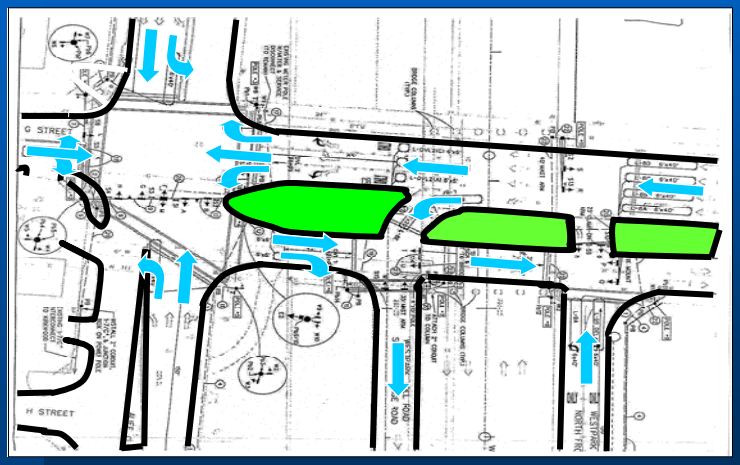

Questions, Comments, Concerns?