The proposed design of the Butzek-Troemel Roundabout, or spiralabout, provides a number of substantial improvements over traditional multilane roundabout design principles. By providing a generally outward spiraling lane design instead of a continuously circulating lane design, approach capacity, departure capacity, and circulating lane utilization are all enhanced. Vehicle conflict points are reduced compared to standard roundabout designs with as many approach lanes, thus improving safety. The design provides a viable alternative to traffic signals at significant multilane intersections, and an improvement on the roundabout, an emerging design concept in the United States.
FIG. 1

TRAFFIC FLOW DIAGRAM:
Arrows show direction of flow

Two circulating lanes

Three approach lanes
FIG. 2

BASIC "SPIRALABOUT":
Four legs, two-lane circulating flow with three-lane approaches

Optional pedestrian crossings and sidewalks

Outside lane must exit circle

Pavement markings refer to destination departure, and are identical to the pavement markings that would exist at a normal intersection

Lane is added on inside of circle

Two circulating lanes

Yield Line

Three approach lanes
FIG. 3

BASIC 3-LEGGED "SPIRALABOUT":
Three two-lane approaches; one circulating lane at each approach.

One lane on each approach directs traffic to each departure.
MODIFIED 3-LEGGED "SPIRALABOUT":
Second circulating lane has been included at a specific approach to address demand.
FIG. 5

MODIFIED 4-LEGGED "SPIRALABOUT":
Lanes have been added to provide additional left-turn capacity on two approaches.

Extra left-turn lane provided for additional vehicle capacity.
An extra through lane has been provided to allow for additional vehicle capacity.

MODIFIED 4-LEGGED "SPIRALABOUT":
Lanes have been added to provide additional through capacity for one roadway.

An extra through lane has been provided to allow for additional vehicle capacity.
BACKGROUND OF THE INVENTION

Roundabouts are an emerging roadway design concept in the United States. Roundabouts are designed as an alternative to traditional traffic control at intersections, replacing a traditional intersection with a circular roadway providing one-way flow of traffic (counter-clockwise in the United States). A general principle of the roundabout is to maintain movement of vehicles while reducing vehicle speeds. Traditional intersections allow high speed travel, while stopping vehicles in one direction to allow movement in another. Roundabouts provide constant movement for all directions, while slowing travel speeds to reduce accident rates and/or severity. As roundabouts are applied to a variety of intersections, the need for multilane roundabouts has occurred. Multilane roundabouts provide for additional capacity as compared to single lane roundabouts, but create additional safety concerns.

Existing problems with multilane roundabouts include the tendency of drivers, especially those unfamiliar with an area, to use the outside lane exclusively, as this is the easiest lane to enter and exit the roundabout from. The further toward the center of the roundabout a travel lane is, the more difficult and dangerous and thus less useful it is. For the case of multilane approaches and departures, vehicle conflict points (points where accidents are likely to occur) increase significantly with increasing number of lanes within the roundabout (circular lanes). Dangerous situations are created involving crossing vehicle paths and difficult weaving maneuvers. Existing multilane roundabout design principles accept these challenges as drawbacks of roundabout design. Our proposed design addresses these issues, and provides a design that improves safety and enhances capacity of the traditional multilane roundabout by way of significant modifications to roundabout design principles.

BRIEF SUMMARY OF THE INVENTION

A traditional multilane roundabout is designed so that the number of circulating lanes (lanes within the roundabout) is generally consistent throughout; lanes are generally unchanneled (a driver can turn any direction from any lane) and circulating lanes are often unstriped (no pavement markings to delineate lanes are provided). Typically, a driver can get “stuck” in the roundabout, and travel indefinitely in the same lane without exiting the roundabout (those familiar with the movie ‘National Lampoons European Vacation’ will no doubt remember the scene with the recurring line: “Look kids, Big Ben, Parliament.”) Our design capitalizes on the fact that no driver should desire to remain in the roundabout longer than necessary. The principle of our roundabout is as one travels around the roundabout, lanes are added on the inside and dropped on the outside by way of right-turn only lanes. Any given lane should not make more than one full revolution about the circle before being forced out of the roundabout, which should reflect the desired path of drivers. A lane or lanes would be added on the inside of the roundabout at many or all of the approaches. This design also allows for an optional additional approach lane to be provided to utilize the newly added lane(s), thus increasing vehicle capacity of the intersection approach. The resulting geometric configuration is a spiral lane configuration, as lanes begin in the center and spiral outward. It is considered necessary to stripe the roundabout in order to clearly delineate the lane configuration, as this spiral configuration is not intuitive to drivers using the roundabout. Because at least one lane is usually a right-turn only lane, multilane departures can be provided with fewer vehicle conflict points as compared to traditional roundabout design.

BRIEF DESCRIPTION OF THE DRAWINGS

In general, FIGS. 1-3 describe the “spiralabout” concept. FIGS. 4-6 show flexibility in the concept by way of modifications to the basic concept which provide additional capacity to specific movements. These or similar modifications would be expected to be necessary to address concerns on a site-specific basis.

FIG. 1 is a traffic flow diagram with arrows showing the vehicle paths that the “spiralabout” principles are based upon. In this diagram, two circulating lanes and three approach lanes are provided at each entry.

FIG. 2 is a plan view of a design concept showing the basic “spiralabout” concept. FIG. 1 refers to. In this design, two circulating lanes and three approach lanes are provided at each entry. The gray double lines at the roadway edges depict curbs. Roadway markings are shown in black, and include lane striping, arrows to direct traffic, the yield line, striping to direct traffic entering the roundabout, and cross-hatching to identify shoulders. Pedestrian treatments, including stop lines, crosswalks, and sidewalks are optional features, and are included in this design.

FIG. 3 is a plan view of a three-legged version of the concept. Because there are only three approaches, two approach lanes and one circulating lane are provided at each entry.

FIG. 4 is a plan view of a modified three-legged “spiralabout”, a design that provides an extra through lane for the approach on the right, providing two lanes of capacity for vehicles to travel from the approach on the right to the departure on the left, and providing two lanes of capacity for vehicles to travel from the approach on the left to the departure on the right.

FIG. 5 is a plan view of a modified four-legged “spiralabout”, a design that provides additional left-turn capacity at the lower approach and the left approach by adding a left-turn only approach lane for each. An additional circulating lane is required for specific approaches to carry this added lane through the roundabout.

FIG. 6 is a plan view of another modified four-legged “spiralabout”, a design that provides additional through capacity for the street oriented from top to bottom.
An additional through lane is provided on the top and bottom approaches, with additional circulating lanes provided as necessary to carry these lanes to their appropriate destinations.

**DETAILED DESCRIPTION OF THE INVENTION**

[0014] The Butzek-Troemel Roundabout, or “spiralabout”, provides an improvement on traditional roundabout design for most multilane roundabout situations. The design is based on existing roundabout design, and the overall design utilizes existing design principles with regard to pedestrian facilities, application, and geometric principles not pertaining to the approaches, departures, or circulating lanes. The design is flexible enough to allow lane additions, deletions, and realignments where necessary to address specific capacity concerns, some examples of which are shown in FIGS. 4-6, but in general provides an outward lane shift over the revolution of the circle.

[0015] While specifies such as the number of lanes added or dropped at a given point can be adjusted, the basic principle involves lane addition at each approach and lane removal at each departure, enhancing the capacity of both the approaches and the departures. In its simplest form, the spiralabout provides one fewer approach lane on each approach than the number of approach legs (i.e. three (3) approach lanes per for a four-approach intersection). The number of circulating lanes is typically one less than the number of approach lanes for each approach, and a circulating lane is added on the inside of the roundabout to receive traffic from the extra approach lane. By guiding vehicles into the correct lane when entering the spiralabout, vehicles can navigate the spiralabout without changing lanes within the circle, or cutting across other vehicle paths, both of which are a frequent necessity in a traditional multilane roundabout.

[0016] By forcing the outer circulating lane to exit at each departure and adding a lane on the inside of the spiralabout to receive entering traffic, approach capacity can be provided for one more lane than exists in the circulating lanes. Therefore, entering traffic must yield to fewer lanes of circulating traffic. For example, in the case of a four-legged spiralabout, a typical approach would consist of three approach lanes that would yield to two circulating lanes. Traditional multilane roundabout designs generally result in no more approach lanes than circulating lanes, except in the case of separated right-turn lanes. The spiralabout differs from the case of separated or channelized right-turn lanes in that right-turning vehicles enter the spiralabout into a circulating lane. By providing a larger number of approach lanes with an identical number of circulating lanes as compared to traditional multilane roundabout design, approach capacity is enhanced. By forcing a lane out of the spiralabout at each departure, and allowing for a shared through/right-turn lane to the inside of the right-turn only lane, departure capacity is enhanced. In addition, severe vehicle conflict points created by allowing multiple shared through/right-turn lanes at major departures, as seen in traditional multilane roundabout design, are eliminated. Lane utilization, defined as the usefulness or effectiveness of each lane, is more balanced. In traditional multilane roundabout design, the inside lanes of a roundabout are difficult to enter (because of the need to cross circulating lanes), difficult to exit (for the same reason), and are accident-prone. As a result, vehicles are less likely to use the capacity provided by these lanes. The spiralabout solves this problem, as each circulating lane directs its vehicles to its respective departure without the need for any lane changes throughout the path. Each circulating lane is the most logical lane to enter the spiralabout in for a specific departure choice, and as a result the usefulness of all lanes is enhanced. This is not the case in traditional multilane roundabout design, where the inside lane is less utilized. The spiralabout enhances approach capacity, enhances departure capacity, enhances circulating lane utilization, and reduces vehicle conflict points.

[0017] Specific application potential for the Butzek-Troemel Roundabout would depend on capacity research conducted on prototype designs, but is expected to include potential high volume roundabout locations under consideration and medium-volume existing signalized intersections. The spiralabout is expected to enhance safety and operational efficiency for locations which would be expected to be adequately served by traditional multilane roundabout design, and is expected to be applicable at some locations where traditional roundabout design has been rejected due to capacity limitations.

We claim as the invention the following:

1. Geometric design principle involving shift of circulating lanes outward by way of the addition of lanes on the inside and the forcing of outside lanes toward the departures.
2. Geometric design principle typically moving vehicles out of the roundabout within one revolution.
3. Geometric design principle aiding drivers in being in the appropriate lane for their destination and discouraging traffic from remaining in the circle longer than necessary by way of exit-only lanes.
4. Additional approach capacity provided by allowing one more approach lane than circulating lane by way of a lane addition on the inside of the circle.
5. Enhancement of utility or value of internal circulating lane(s), as each lane directs vehicles toward a departure that would be considered logical to an entering driver (i.e. a right turn, through, left turn, or U-turn movement).
6. Flexibility in design to allow for modifications to basic design providing additional vehicle capacity for specific movements through the addition of approach and circulating lanes, as necessary (examples of which are shown in FIGS. 4-6).